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THE DRIVER. [*See p. 112.*

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STRATEGICAL AND TACTICAL ASPECTS OF COAST DEFENCE IN THE FUTURE.

A Lecture delivered at the Royal Artillery Institution, Tuesday, 20th October, 1925.

BY COLONEL (TEMP. COL. COMDT.) J. E. S. BRIND, C.B., C.M.G., D.S.O.

Major-General B. R. Kirwan, C.B., C.M.G., in the Chair.

CHAIRMAN: Coast Defence as a subject for a lecture in this Institution would a very short time ago have been looked upon as rather dull, and in view of the experiences of the Great War, perhaps lacking in interest. However, that has all changed, and now the tendency is all the other way, and it is likely, we believe, to grow in importance not only to our own service but indirectly to the navy as well. Then too there is the fact of the amalgamation of the regiment, one consequence of which is that any regimental officer may now find himself doing a tour of service in coast defence. So that this choice of a lecture for the first one of this new season is, I think, a happy one.

But if the subject chosen is good we are, I think, more fortunate still in the selection of a lecturer, for Colonel Brind is a specialist at this and he has studied the subject closely, and a great deal of weight can be attached to what he says. I think in fact it would be difficult to find anyone more qualified than he is to tell us all about coast defence and especially the strategical and tactical aspects of coast defence which he is specially going to speak of.

COLONEL BRIND: I propose, this evening, to talk to you on the subject of Coast Defence mainly from the Imperial and strategical point of view, that is, from the point of view from which it is considered by the General Staff. I do not propose to discuss the technical aspect at all, as that comes, I believe, within the scope of another lecture which is to be given here. Moreover I am in no way qualified to talk to you about the technicalities of the subject.

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To begin with, I am going to state one or two basic principles—principles on which the whole policy of coast defence is based. They may appear to be platitudes, but it is essential to bear them constantly in mind, if one is to understand the necessity for coast defence, and the policy on which defence measures are based.

"Control of the seas is vital to the Empire"—vital, not only because we, in this island, are dependent, as we all know, on supplies from overseas for our food—not only, because we are dependent on our overseas trade for the raw materials on which many of our industries exist in times of peace and without which in war, we should soon be totally deficient of munitions, it is vital also from the point of view of defence, to insure our homeland and our overseas possessions against the risk of seaborne invasion—it is vital from the point of view of communications, as it enables us to reinforce distant portions of the Empire, as and how we wish, and it is vital from the point of view of offence as it enables us, as it has done for centuries past, to carry our wars into the enemies' territory, or, at least, to ensure that the theatre of war is in territory other than our own. That is an inestimable advantage which I don't think is always quite realised in these days.

Now the control of the seas lies within the sphere of responsibility of the navy, but the navy can't do all this for us without secure bases from which to operate. They must be free to operate in the waters surrounding our homeland, in the waters adjacent to our Dominions, to our overseas possessions, and to the countries from which our main sources of supply are drawn, and free to operate also on the main lines of communication which connect the Mother Country and the rest of the Empire, and the various portions of the Empire to each other. With our Empire scattered as it is all over the face of the globe, it is difficult to see what waters we should not want to control in wartime, to secure our imperial communications, and to ensure that "our frontier remains the enemy's coast line."

Though the bases required are nothing like so numerous as they were in the past they are more vital and perhaps more vulnerable than ever. May I take you back for a moment to the situation as it existed before the war, and then lead up to the situation as it exists at present.

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We used to maintain what was called a two-power standard of naval strength, that is a sufficiently powerful fleet to deal with any likely combination of two foreign powers. Several other powers in Europe before 1914, maintained fleets of considerable size. Germany's navy was second only to our own, France and Italy maintained powerful fleets, and Austria and Russia had naval forces which were by no means insignificant. Across the Atlantic the United States maintained a large fleet, and Japan's navy was preponderant in the Far East. In order to meet and be prepared for the German menace our main fleet was, some years prior to the war, concentrated in home waters. This was facilitated firstly by our alliance with Japan and secondly our friendship with the U.S.A.

Now the situation is very different. Germany, as a naval power to be considered, has disappeared from the picture, so have Austria and Russia. France and Italy remain, but with the disappearance of the fleets of their heriditary enemies, the maintenance by them of large naval forces has become far less essential. Moreover the size and numbers of their capital ships has been limited by the Washington Agreement to which I shall refer presently.

The United States on the other hand has, as the result of the war, been left with a fleet vastly superior to that which she maintained before the war. In fact, had she completed the shipbuilding programmes contemplated at the end of the war, the British Empire would now be in a position of inferiority or committed to a competition with the U.S.A. which would have cost us millions.

In the Far East Japan maintains a fleet inferior in capital ships only to fleets of the U.S.A. and ourselves.

The Washington Agreement may be said to have stabilised this state of affairs for at any rate the next ten years or so. The five leading naval powers have agreed to a definite ratio of naval power in capital ships and aircraft carriers. This ratio, as far as the British Empire, the U.S.A. and Japan are concerned, is represented by the figures 5 : 5 : 3, that is, equality as regards ourselves and the U.S.A. while each of us may maintain a 5 to 3 superiority over Japan. France and Italy combined may maintain capital ships which amount to rather less than the British Empire or than the U.S.A.

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These figures apply only to capital ships, i.e., battleships or battle cruisers, and to large aircraft carriers. We, with our world-wide responsibilities, insist on the right to maintain as large a number of cruisers as we require, and no limitations are imposed on the numbers of destroyers, submarines, aircraft carriers of under 10,000 tons and other small craft.

Another very important agreement was made in connection with the Washington Conference, by which a large area south of Japan, embracing Hong Kong and stretching far out into the Pacific was placed "out of bounds"—so to speak—as far as construction of naval bases and new construction on coast defences was concerned.

The general situation, therefore, as the result of the great changes brought about firstly by the war, and secondly by the Washington Conference, is that

(a) In European waters we are easily supreme, and the only powers who have fleets of any appreciable size are our late allies, France and Italy.

(b) In the west, across the Atlantic, there is a great fleet equal to our own maintained by a friendly power and late ally, with whom we have agreed, for the time being, not to compete.

(c) In the Far East, Japan has local superiority and can at present maintain that superiority, as although we and the U.S.A. maintain larger fleets they cannot function in those waters, as neither power has a base from which to operate.

I have now touched on what I may call the Imperial aspect, that is the fact that the Empire is dependent on the navy for control of the seas and therefore of Imperial communications, and the navy is dependent on secure bases from which it can operate. The army is still responsible for the security of those bases. I have also outlined very briefly and very sketchily the present strategical situation as it affects coast defence. I now want to turn to some of the recent developments and changes which come rather within the tactical sphere.

There was considerable doubt after the war whether the old method of fixed gun defence was still the most suitable for coast

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defence, or whether, in view of modern developments the time had not come to readjust our views and to replace or supplement our guns by other weapons. The subject was gone into in great detail by the Committee of Imperial Defence and the Staffs of the three services, with the result that the conclusion was arrived at that though considerable modifications might be advisable, the time had not yet come for any drastic change in policy and that the gun must still remain the primary means of defence.

It had been suggested that the submarine and aircraft might form better deterrents to hostile fleets than fixed defences. As regards submarines, the Naval Staff maintained that they were mobile forces belonging to the fleet, which must be free to operate with the fleet, and cannot be tied down to the task of defending some particular fortress or base. Furthermore, they were of the opinion that submarines, by themselves, would not form an adequate deterrent, though, if present, they would form a very valuable addition to the defence; that they had considerable limitations at night, and that the advance of anti-submarine measures was rapidly lessening the power of the submarine as a menace to a hostile fleet provided with adequate means of protection.

As regards aircraft the same argument against the locking up of mobile forces applied. Furthermore the installation of aerodromes, workshops, etc., in all our scattered fortresses throughout the Empire would involve very considerable expenditure. Finally, in their present state of development—one cannot say what might happen in the future—it was quite clear that aircraft, except in prohibitive numbers, could neither compete in accuracy or maintenance of a rate of fire with the guns, that they were far more vulnerable and had no means of correcting their errors. This applies only to the present state of development of aircraft. If they can add extreme accuracy to the undeniable advantage they now have in range, there may be very considerable modifications in the views now held, and the decisions hitherto arrived at.

Broadly speaking, then, the conclusion was arrived at that no revolutionary change in the system of coast defence was yet possible. Just as in the past, history shows that no new weapon or invention has ever caused sudden revolutions in the art of war, so in the

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present time must the new weapons or arms take their place in the first instance side by side with the older weapons, until either they produce their own antidotes, or in the process of development they absorb the functions of their predecessors.

With regard to the gun itself, it was argued that the majority of our coast defence guns never fired a shot in the war, but this is certainly not a proof of their failure, it is rather a proof of their success as a deterrent. The primary object of coast defence artillery is to deter enemy ships from bombarding or attacking the vulnerable points it is designed to protect, in fact to make the game not worth the candle, and the existence of the defences is fully justified if the enemy is prevented from even attempting to damage the ports and bases they are there to defend. The German fleet, in its occasional hasty raids on our coasts, avoided any but the most lightly armoured defences. Their cruisers and raiders all over the world fought shy of all defended ports. In our own attacks on the somewhat out-of-date Turkish defences of the Dardanelles, we did but little harm to those defences and suffered considerable damage to several of our older battleships and cruisers.

In fact fixed gun defences still have certain distinct and definite advantages over the ship. Briefly these advantages are—a fixed and stable platform—greatly superior means of range-finding and often of observation—less limited ammunition supply—they afford a far less visible target and are infinitely less vulnerable. In every one of these attributes the existing advantages would be sacrificed by the substitution of submarines or aircraft for guns. The one great advantage that both have over the gun, namely that they can operate much farther afield, provides really a reason against their being tied down to the defence of particular localities.

The advantages of the gun over the other forms of defence, are therefore that it is a proved deterrent up to the limit of its range of observation from the shore. It is less vulnerable to hostile attack and less affected by the elements. It is very accurate and cheaper to provide, and it is a permanent deterrent which is not liable to removal from its allotted task. The personnel can be removed, and undoubtedly would be as the campaign goes on, and they would be replaced by war-trained or by local forces, but the gun would still remain and provide the necessary deterrents to attack.

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Considerable changes have taken place as regards the guns themselves, the most important of which, without going into any technical details, is the great increase in range. Guns can now fire at ranges which are far beyond the range of observation either from shore O.P's or from ships. Modern war vessels are equipped and are being equipped with these long range guns, and aircraft provide a means of observation which will enable fleets or squadrons to bombard ports and harbours from distances which are beyond the range of observation of shore O.P's. The obvious answer to this lies in the modernisation of the fixed armament and the provision of aerial observation for the batteries on shore.

Another point which arose as the result of the war, was whether guns on railway mountings could suitably replace guns on fixed defences. The conclusion come to after very considerable discussion and thought, was that, as a general principle at any rate the change would not be economical, and that owing to lack of traverse and their limited arc of fire, guns on railway mountings would not provide so effective a deterrent nor so accurate a weapon against moving targets as guns on fixed mountings. There may be places where, in the future, guns on railway mountings may be considered suitable, but as a general rule their adoption was not approved.

Now, if I may digress for a few minutes, I'd like to tell you how this problem of the defence of both at home and overseas ports is tackled by the responsible authorities. The Committee of Imperial Defence is finally the body responsible for making recommendations to the Cabinet. It works through a number of sub-committees on which the Admiralty, War Office and Air Ministry are represented. The War Office Directorates of Operations and Intelligence, of Artillery, and of Fortifications and Works all provide members, and all three Ministries are represented by the branches most intimately concerned with the problem. The Colonial Office and India Office are also represented when directly concerned.

Under the normal procedure the Admiralty takes the first step, and considers, in accordance with the general naval strategical situation, and the distribution and disposition of our fleets, what ports and bases in certain waters are essential in order to allow our

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fleets and squadrons to operate, and to replenish fuel and ammunition and supplies, to shelter our merchant vessels, and for the assembly of convoys, and so on. Having decided what ports are essential and vital to our requirements, the next step also rests with the Admiralty who estimate in accordance with the dispositions of our own and potentially hostile fleets, and the degree of importance of the locality to be defended, what is the likely scale of seaborne attack to which each port is liable. This scale of attack may vary from bombardment by the enemy's battle fleet, to attack by raiding cruisers or auxiliary vessels, down to attacks by blockships, or attempts by destroyers, submarines or coastal motor boats to damage vessels or dockyards, etc. The liability of each and every defended port to any of these scales of attack is worked out, and forms the basis of the scale of defence for which eventually the Army becomes primarily responsible.

Similarly, in the cases of certain defended ports, the Air Ministry work out the scale of air attack to which those ports may be liable. This depends on the proximity of the aerodromes of potentially hostile powers, on the number and capacity of such aerodromes, on the types of aircraft with which they are equipped, and the facilities for repair and means of reinforcement. In some cases also the feasibility of constructing temporary aerodromes in neutral or allied territory has to be considered.

Having then appreciated the dangers to which each port to be defended is exposed, it becomes the duty of the Naval, General and Air Staffs to make their recommendations as to the scale of defence necessary to secure the port against those dangers. The Admiralty are responsible for all such arrangements as mines, booms, etc., in fact all defence measures taken beyond the high-water mark. The Air Ministry are responsible for making recommendations for any fighting and bombing or other aircraft which may be considered necessary for defence against air attack, or offensive action against enemy aircraft or vessels, for reconnaissance, and (in conjunction with the War Office) for artillery observation, but as I said before, the policy of locking up little packets of aircraft all over the Empire is not considered economical or strategically sound.

The War Office are responsible for making the recommenda-

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tions for the scale of gun defence necessary to deal with the anticipated scales of attack, whether from the sea or from the air, and for the lights necessary to enable those guns to fire at night. They are also responsible for asking for such aircraft as are required to observe the long range fire of the guns. The General Staff are just as averse from locking up in static defence mobile units which will be wanted in the main theatre of operations, as are the Naval and Air Staffs, and it is fully realised that every penny spent on static defence, and every man locked up in a fortress or base, has to come against the funds and personnel available for the Expeditionary Force. On the other hand the Expeditionary Force can never leave these shores unless the navy has control of the seas, and can adequately protect it during its passage and its lines of communication, and the navy cannot do that unless it has secure bases from which to operate. So it may be said that the art in coast defence policy consists in the provision of the minimum scale of defence which will afford an adequate and certain deterrent to the evil intentions of the fleets and in certain cases the air forces of hostile powers.

Experience shows, and common sense indicates, that an inferior fleet cannot afford to risk its capital ships in an engagement with up-to-date defences, save in very exceptional cases, when the object to be achieved is so important and the local conditions are so favourable to the attacker, as to make the risk worth taking.

This was borne out by the experience of the war. The Germans, with their inferior fleet, never risked their ships in an attack even on our most lightly defended ports. We, on the other hand, with our numerically superior fleet were prepared to risk a proportion of our vessels in an attack on the Turkish defences at the Dardanelles, but even then we practically only risked our older capital ships, the forts we attacked were not up to date or very efficient. We had immense local naval superiority in the Mediterranean and could undertake the operation without weakening our main fleet in the North Sea, and the political and strategical objects to be achieved were considered to be well worth the risk involved. How great the risk of loss to the fleet was is well demonstrated by the results. On March 18th, 1915, the Turkish batteries defending the Narrows were deliberately attacked by

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something like 16 battleships at the comparatively short ranges of from 10,000 to 14,000 yards. The Turkish batteries and guns were old, their works were badly sited and they were very conspicuous. The damage done to them however was small. One battery for instance, consisting of three 14-inch and six 9·2-inch guns had one 9·2-inch put out of action, and some casualties to its personnel. We on the other hand lost three battleships sunk by mines, and three more so badly damaged by shell fire that they had to be immediately withdrawn to a dockyard.

Again, a large number of attacks, about 40 in all I believe, were made by British monitors on the temporary defences of the Germans on the Belgian coast, but in none of these was any German gun mounting or magazine hit.

Those attacks were carried out by old vessels and monitors, but we never pitted our modern vessels against the well-equipped and efficiently manned permanent defences of the Germans. Our superiority over the Germans was not sufficient for that risk to be taken, and our main fleet had to remain intact to deal with the German battle fleet if and when it emerged from its bases. I think if we remember the amount of ammunition it took to knock out a battery in a destructive shoot on the Western front, with stable platforms, accurate observation and ranging, one can realise how difficult this task is when carried out from a rapidly moving ship.

We have always dealt with the problem of coast defence as a nation quite differently to other great powers. With our naval superiority we have hitherto been able to accept a much lighter scale of defence than they were able to accept. Whereas until recently we were satisfied with the 9·2-inch gun as the heaviest coast defence weapon and those only in moderate numbers, France, Germany and other powers have for many years maintained large numbers of 11-inch and 12-inch and even larger guns in their coast defences, because they had to face the possibility of attack by the battle fleet of a superior naval power and considered that nothing less than really heavy guns would provide an adequate deterrent. One cannot get away from the fact that as a power's scale of naval superiority diminishes, so must the scale of defence of her bases and ports increase.

America appears nowadays to be the power which is expending

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more money than any other power on her coast defence system, in which she is installing guns up to 14-inch and 16-inch calibre in her defences both on her Atlantic and Pacific seaboards. It is difficult to understand why she is taking these excessive precautions, in view of the fact that the only other great naval powers are separated from her shores by thousands of miles, but that is her business, and she is probably prepared to pay a great deal higher rate of insurance than we could possibly afford.

I referred just now to the general situation which had been brought about as the result of the war, and as the result of the Washington Agreement. I would like now to go into a little more detail, and to consider how that situation affects us and our Empire, and the simplest method will be to consider the strategical situation first in home waters, secondly in the Mediterranean through which pass our main trade routes and shortest line of communication to our Dominions, possessions and markets in the East, then to consider the situation east of Suez, and in particular in the Far East and finally the situation in the Atlantic.

Great Britain is the hub of the Empire and the whole structure which has taken centuries to build up depends on her security, and on the uninterrupted flow of trade to and from her ports. France is the only naval power within reasonable reach of our shores, and our superiority in naval power over France is adequate and fixed for some years to come by the terms of the Washington Agreement. But France is also a great air power, and just as adequate measures have to be taken to secure our country from even a remote chance of air attack, so have measures to be taken to ensure that our navy has secure bases from which to operate, and that our commercial harbours are rendered as safe as possible for the free movement, loading and unloading, docking and refitting, and so on, of our mercantile fleets. The interests of our country and of France are identical; we both require peace for reconstruction. The danger to both countries in the future lies further east, though we hope that that danger is still very remote. Friendship between the two countries is essential, not only for our own sakes, but for the peace of the world. But experience shows us that political situations change, and that they change far more rapidly than defensive measures can be taken, and that, if defensive measures

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are left till the last moment, there is a danger that they will never be taken for fear of upsetting a delicate political situation and for fear of precipitating a conflict that politicians are striving to avoid. Therefore it is incumbent on us to take such steps in peace to protect our interests and our country from any danger of attack either from the air or from the sea by another power, no matter how friendly that power may be, and no matter how serene the political horizon may appear. The conclusion then as regards our home ports, both naval and commercial, is that adequate steps should be taken to provide a sufficient deterrent (but no more than a sufficient deterrent) to attack, either from the sea or from the air.

In the Mediterranean, through which passes a very large proportion of our trade, the vital points as far as we are concerned, are Gibraltar, Malta, and the Suez Canal, in other words the points which control the entrances and exits, and the narrow waters between Sicily and North Africa. Here again, the only naval powers to be considered are our late allies—France and Italy—and our firm friends, we hope, for many years to come. But as in the case of our home ports precautions must be taken to be prepared in time for possible changes in the political situation, and our navy must be free to operate in, or move through, Mediterranean waters and to prevent, if possible, the dislocation of our trade which would result in the closing of the Mediterranean and the diversion of merchant shipping to the route round the Cape of Good Hope. Owing to the preponderance of our navy a heavy scale of coast defence does not appear to be necessary either at Gibraltar or Malta but both fortresses are, or will be within the near future, within reach of air forces based on foreign territory, and therefore it appears more than probable that an adequate scale of defence against air attack will have to be installed both at Gibraltar and Malta.

The Suez Canal, which is neutralised, does not come within the sphere of coast defence, so I will say no more than that it is vital that our interests should be secured by the continued presence of British troops in Egypt.

If we turn to the strategical situation east of Suez we find a very different state of affairs. Our interests in and bordering on the waters of the Indian Ocean and the Pacific are vast, very

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scattered, and separated by immense distances. We have on our main line of communication to the East, a number of defended ports at or near (as in the Mediterranean), the vital strategical points, Aden, Colombo, and Trincomalee, Singapore and Hong Kong, with Mauritius midway between India and South Africa; we have on the coasts of India and Burmah the ports of Karachi, Bombay, Madras, Calcutta and Rangoon. We have to consider the defences of Australia and New Zealand (the Dominions are of course responsible for the protection of their own harbours), and we have great interests in the east coast of Africa, and in the Persian Gulf. The bulk of our navy, and the whole of our capital ships are concentrated in European waters, and our interests east of Suez are guarded by squadrons of cruisers and smaller vessels. The only great naval power in the east is Japan, another ally of the Great War, and a power which was our ally for years. That alliance has now been abrogated, and its place has been taken to a certain extent by the Washington Agreement. But the fact remains that we are in a position of naval inferiority in those waters, and that in the unfortunate event of trouble we should have to be prepared to defend ourselves till our fleet could arrive and when it arrives it would require a base from which to operate, and one which is capable of docking the largest type of capital ship. That is the whole genesis and *raison d'être* of the Singapore scheme. It is purely a defensive measure. It is much too far from Japan to be aggressive in any way, but its defence, by allowing the fleet to operate freely will secure for us our communications and our trade in the Indian Ocean, the communications and trade route between Ceylon and Australia, and the entrance to the Pacific. A high scale of defence will be necessary there because of its importance, and because of its distance from possible reinforcement. With Singapore secure a comparatively light scale of defence can be accepted at the defended ports west of it in the Indian Ocean. But with no secure base from which our fleet could operate at Singapore, a much higher scale of defence would be required at all the other eastern ports, which would in the end probably cost us as much or more than the proposed base, and which would not be nearly so effective.

Hong Kong requires separate and special consideration. By

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the terms of the agreement made at Washington we are precluded from adding to our coast defences there. But Hong Kong has a land front, and it is from that direction that most anxiety may be caused in the future. Our interests in Hong Kong are enormous, as the volume of trade passing through that port is greater than that passing through any other port in the Empire.

In the Atlantic we have defended ports at Bermuda and Jamaica, in the west, and at Sierra Leone in the east. The other great naval power interested in the Atlantic problem is the U.S.A., but our interests are so similar that it may be anticipated that a comparatively light scale of defence will be considered sufficient to meet our requirements at those ports.

That being briefly the situation which we have to face in the various portions of our Empire, it now remains to see to what extent we are prepared to meet our responsibilities. As regards material the requirements of the ports east of Suez have been settled and approved, in general, by the Committee of Imperial Defence. The requirements in European and western waters are being worked out in accordance with the procedure I spoke about just now. Speaking generally the armament requires bringing up to date as no changes have been made since some years prior to the war, and the range of many guns is inadequate. In many cases the necessary results can be obtained by substituting 45° mountings for those now existing.

As regards personnel, as most of you know, it was decided after the war that the existing artillery personnel could be reduced practically to nucleus garrisons, which would be reinforced when the situation demanded it. Financial considerations demanded these reductions, and it was considered that the strategical situation was such that the risk could be accepted. The difficulty will be to reinforce in times of peace, as the necessary funds and personnel will be difficult to obtain. It is, therefore, very essential that those nucleus garrisons should be very highly efficient, and that preparations should be made to make up the deficiencies at very short notice from territorial units at home, and from local resources overseas. All our artillery units in coast defence at home and abroad are now organised on a heavy battery basis, and are also trained as mobile units with their movable armament, so as to be

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ready in case of emengency to take their place in the field army as heavy or medium batteries, as soon as the situation admits of their relief by territorial or local units. The provision of transport with which to train is a difficulty which is fully realised; it is a question of finance and we live in hope that it is a difficulty which will be overcome, at any rate to a limited extent, some day.

That brings me nearly to the end of my remarks on the wider aspects of coast defence, and before I conclude I would like to say a few words mainly to the younger members of my audience. Now that the Regiment is one, many of you may at some time in the future be posted to heavy artillery units in coast defences. You may feel that with the small numbers available you are being asked to make bricks without straw. But the smaller the nucleus garrison, the more important it is that every man in it should be efficient. If every regular serving soldier can be trained to be a skilled worker of one sort or another, the unskilled or less skilled members of the unit can soon be trained from personnel enlisted on the emergency arising.

Then as regards the other rôle of artillerymen serving in coast defences—the heavy artillery rôle—I purposely do not call it the second rôle because it is every bit as important as that of coast defence, and may in certain circumstances be the more important of the two. The urgent demand for more medium and heavy artillery in the early days of the war and the difficulties and delays in meeting that demand are well within the memory of many of you. It was the same at the beginning of the South African war and in 1922 when hostilities with Turkey appeared imminent the same demand was made again. And so in all probability will it be when war comes again. After the close of the Great War it appeared that we had learnt our lesson, but down came the Geddes Axe, with the result that the organisation of our medium and heavy artillery for the expeditionary force is not by any means all we could wish it to be. It is simply a question of cost; we can't have all we would wish so we have to make the best use of what we have got. In some ways we are far better off than we were prior to 1914. We have the guns. We have the units suitably organised to take their places in the field if needs be. It rests with us to give those units the necessary training, as far as facilities admit, to

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prepare themselves as units of the field army ready to take their place in it as soon as steps can be taken to relieve them of their coast defence duties.

Service in many defended ports, too, affords great opportunities for co-operation and liaison with the navy. It is remarkable how few opportunities one gets in most ordinary soldiering of getting in touch with the sailors, and for a great island power like ourselves it is all important that every opportunity should be taken to co-operate and get to know each other's point of view.

There is one other point of great importance from the imperial as well as the purely military point of view, and that is no opportunity should be lost of helping and giving encouragement to the local forces. They vary immensely in different places. In some cases the local people exhibit the very general British trait of leaving volunteering to the few enthusiasts, at any rate in peace time, though doubtless they would offer their services, as their predecessors have, in hundreds, if another real emergency arose. Encouragement and assistance from the regular is what is wanted everywhere.

There is one question that is sometimes asked which I have not touched on, and that is, why is not coast defence handed over to the navy? The question was gone into both before and after the war and was turned down, both by the Admiralty and the War Office. There is no need to go into all the reasons; it will be sufficient to point out the difficulty of defining dividing lines of responsibility between the sailor and the soldier, particularly when there is the defence of a land front also to consider. The present dividing line is the high water mark and that is clear enough. Another important reason against the change from the army's point of view, is that in the event of a great war we should lose all that great reserve of trained artillerymen, which was so valuable to us in the last war.

Whether the air will ever be able to assume control of coast defence is a matter which lies in the lap of the future. It depends on whether the bombers and torpedo-carrying aircraft of the future can provide as efficient a deterrent as the gun, and when that is the case the experts of the future will have to consider whether the change is economical and wise.

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CHAIRMAN: Has Colonel Hardcastle any remarks to make?

COLONEL HARDCASTLE: I really am not qualified to deal with the strategical aspect of the situation, but there was one thing which struck me. Colonel Brind said that the Air Ministry were not going to lock up their planes. In a place of vital importance like Singapore I think it is absolutely necessary that it should have some planes actually on the spot to work with the guns.

COLONEL BRIND: That has been the demand of the General Staff.

COLONEL HARDCASTLE: One other thing was the question of obsolete battleships. The lecturer was talking about our bombarding Gallipoli with obsolete battleships. According to the Washington Agreement there will not be any such obsolete ships in the future, though it is mentioned in the memorandum passed round. We have to open the sea-cocks and put them down.

CHAIRMAN: Does any other officer wish to make any observations—any naval officer?

Then it only remains for me to congratulate Colonel Brind on his most excellent and instructive lecture. He has given us all a great deal to think about and ponder over, and we should thank him for the trouble he has taken in preparing this lecture and coming down here to deliver it.

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DEVELOPMENT OF ARTILLERY MATERIAL.

A Lecture delivered at the Royal Artillery Institution, Tuesday, 17th November, 1925.

By Colonel (Temp. Col. on the Staff) S. W. H. Rawlins, C.B., C.M.G., D.S.O.

Lieut.-General Sir Noel Birch, K.C.B,, K.C.M.G., in the Chair.

Chairman: Gentlemen, the lecturer requires no introduction and I will ask him to go on.

Colonel Rawlins: You are all aware of the old platitude that, as regards artillery material, increased power is ever the cry in war; increased mobility, the demand of peace. But at the present time the army calls for greater range, greater power, greater mobility, more traverse, higher rate of fire, etc. In fact, the situation may be summed up in saying that everyone wants an ideal weapon for every artillery task without, I am afraid, troubling his head much about such uninteresting details as cost and manufacturing limitations. These must always carry great weight and certainly do so at the present time.

A brief study of the main tasks of artillery in action will show that for one task range is the chief requisite, for another shell-power and for another mobility.

Accuracy is wanted, of course, in all cases.

But there are various opposing technical factors to be faced and we must in fact accept some degree of compromise, i.e., we must decide upon the preponderating requirement for each equipment, provide that, and arrange for as many of the subsidiary requirements as may be possible. Let me remark here that our artillery equipments must be suitable for each of the many natures of war, small or great, upon which our troops may be called upon to embark.

Now I should like to discuss briefly the three main considerations of range, power and mobility (or weight, which is often though not always a synonym for mobility) and see how they re-act on one another. We may summarise their relation by saying that increased

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range or a heavier shell involves greater weight of equipment and therefore tends to reduce mobility.

I will deal first with the question of *weight* which is nowadays much affected by the method of draught used, i.e. whether horse-drawn or otherwise.

Dealing with horse-drawn artillery, the general consensus of opinion for field artillery is that the "Weight behind the team" of the 18 pr. Mark V (45½ cwt.) is the utmost that a team of six light draught horses can manage and that, for horse artillery, the weight behind the team should certainly not exceed 30 cwt.

With tractor-drawn artillery, the term "weight behind the team" is of course inappropriate and the situation is governed to some degree by ability to cross the ordinary road bridges of the country but still more, in the case of all artillery mounted on wheeled carriages, by "weight in action." This equally affects horse-drawn equipments of course.

Weight in action is a somewhat contentious question but there is, I think, little doubt that for a field gun we have reached the limit with 31 cwt. in action. This without a platform, is full heavy for switching and entails arduous labour when a gun has to be run up. I do not doubt that with practice and training a regular battery should be able to cope with this weight, but I personally believe it to be very near the border line for the less well-trained and physically less perfect detachments that must sooner or later be found in any great war. We are investigating the possibility of making new designs easier to man-handle in action.

For a field howitzer, with the reduced likelihood of having to run it up, we might accept a weight in action of even 33 cwt. For horse artillery, about 20 cwt. appears to be the right figure. In each case weight is, essentially, a matter closely wrapped up with the tactical handling.

Should it be decided to introduce a platform for all or any of these types of light artillery (and the matter is under consideration), we could accept a greater weight in action. But then we are faced with the necessity of having to carry the platform as an additional article of equipment and, in the case of horse-drawn artillery at any rate, this cannot be done without sacrificing some other desirable quality.

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Increased Range may be attained by :—

(a) Increasing the velocity which will add to the weight of the equipment. This has just been discussed and is generally out of the question as regards light artillery, at any rate.

(b) Decreasing the weight of the shell. This is only operative within certain limitations and in any case involves reduction of shell power.

(c) Improving the shape of the projectile. This line of approach is being explored and gives hope of promising results. Various difficulties are, however, involved, notably as to manufacture, provision of a fuze, packing, etc., etc.

On the whole, then, it appears that where the desired increase of range cannot be attained by improving the shape of the projectile, we shall have mainly to accept an increase in weight—a distinct disadvantage.

It therefore behoves all those who, whether in a position of authority or not, demand increasingly long ranges for our artillery, to weigh carefully the various factors involved and, understanding them, to ask themselves honestly whether the extra range demanded can be justified tactically.

I suggest that very long range offers mainly a moral as opposed to a practical advantage. I do not decry the value of moral effect, but it must in this instance be weighed against initial outlay and cost in gun "life". Long ranges further entail the use of two or more charges with those types of artillery which are required to fire at comparatively short ranges; for no nation could afford, for example, to use its long-ranging charges for short range work.

Frankly, I see distinct objections to the universal use of very long ranging artillery in moving warfare, especially in the early days of a big war. In such circumstances ammunition cannot be unlimited but some commanders, delighting in range, will ask their gunners to shoot at distant (and therefore possibly doubtful) targets in every direction and on many occasions. Still, long range has come to stay and I feel that we shall only get top value out of artillery of this nature if in peace we constantly practice predicted shooting at long ranges.

I will next deal with *Power*.

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Apart from what I have said as to weight, it must be admitted that some limitation in this respect is inevitable. If then the utmost range is demanded of any given equipment, you must be prepared to surrender a certain amount of power. I repeat that you cannot have it all ways.

Now, reduction of shell power sounds alarming but, as a matter of fact, to gain range by this means does not involve a very serious loss of power. Something of the order of ten per cent. reduction of shell power gives a considerable increase of range. The field gun would show up least well in this connection, since we may have to be content once more with a 16 pr. or thereabouts; but this, after all, is the common continental standard. I admit that the result would be a less effective shrapnel than that of the 18 pr.; also a slightly inferior gas or smoke shell.

The question of *Traverse* must be mentioned.

The advent of the tank and allied vehicles has undoubtedly brought about a justifiable demand for wider and more rapid traverse (and incidentally a more rapid rate of fire) than was necessary in pre-war days. Quick traverse can be obtained in three ways:—

(a) By means of the split trail system.

(b) With the help of a platform and central pivot.

(c) By having a light gun that can be swung round easily.

During the last few years we, in common with most other nations, have been exploring the possibilities of *the split trail system* for more or less all natures of artillery. But it is the experience of several nations that for the heavier natures the split trail is not altogether so satisfactory as was, at any rate, theoretically believed.

It adds greatly to the weight of an equipment and becomes extremely cumbrous for heavy natures of artillery. With the lighter and even medium natures, though the factor of added "weight in action" still remains, the split trail system has certain definite advantages for those equipments which may require to do much switching. But each case must be dealt with on its particular merits and will be referred to later in my lecture.

The platform and central pivot system has much to recommend it, especially for the heavier natures of artillery where there is no question of "running up."

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It does of course take some time to lay the platform, and the platform may weigh a good deal and has to be carried on the battery vehicles. But, once laid, switching can be carried out even more easily than with the split trail and the "weight in action" is less.

The rub occurs in the time taken to lay the platform, and this system therefore is not in my judgment suitable for those natures of artillery which may be called upon to drop into action at a moment's notice and to cover a wide area. That is to say, the split trail system has certain advantages for the horse and field artillery guns, while for the field howitzer, medium artillery, and certainly for all heavier natures the platform system seems preferable. We are, however, producing a split-trail medium carriage for the army to try out. Before leaving this somewhat controversial subject I would remind you that the method of transport employed has a good deal to do with the matter. Carriage of a heavyish platform by horse-drawn artillery presents a serious problem which largely disappears with tractor-drawn equipments.

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Now, before I mention the individual lines along which we are endeavouring to improve existing equipments, I should like to say a few words on the fundamental principles of design and supply. The first point is that no nation can afford, least of all in these hard times, to create and maintain an establishment of guns and ammunition (not to mention other innumerable warlike stores) sufficient to meet the needs of a war of national effort. Not only would the capital cost be prohibitive, but the expense of maintenance and of replacements in peace due to deterioration of reserves would possibly be even more alarming. We have therefore got, willy-nilly, to count every penny and to cut our coats according to our cloth. At times the result may appear somewhat depressing to those who, responsible for supply, are fully aware both of the natural demand for better equipments and of the need of national economy. The consolation is that all other nations are, beyond question, in very much the same boat.

Now our regular sources of supply, as far as artillery is concerned, are two-fold; the ordnance factories and certain well-known armament firms. A distinguished committee (of which our chair-

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man to-night is president) has been formed some time since to investigate the requirements of the Services for war and the visible resources to meet such requirements. The work of this committee is, of course, of the highest importance, and it does not require deep thought to see that, in the early months of a great war, there must inevitably be a strict limitation to the number of artillery equipments that can be produced. With the best will in the world and with all the forethought possible, it must take time to bring into effective being the productive efforts of the nation. Transition from manufacture of commercial articles to production of warlike stores is a highly complex problem.

Without touching the multitudinous factors of a technical nature which affect such a transition, I will content myself with asserting that national production will be much facilitated by the simplicity of our requirements. It therefore behoves us to employ as few different natures of artillery as military considerations will admit. Each additional piece introduced into the service complicates the question of supply in war.

It may also be advisable to remark that certain types of machinery can only turn out certain types of guns. The plant that produces a 12-inch howitzer will not produce a field gun, though certain analogous natures of artillery can be turned out by one plant with comparatively little adjustment. Thus, it is essential to determine in advance our artillery requirements for war and to allocate plant accordingly; while in war to change plant over from the manufacture of one kind of gun to another is bound to result in a considerable period during which that particular plant will turn out nothing at all.

All this may at first sight seem to have little to do with the subject of the development of artillery material. But I have touched upon these matters because I wish to bring it clearly home to you that those responsible for such developments must ever bear in mind, not only the tactical and technical attributes of any proposed equipment, but not a whit less the financial and manufacturing aspects which are entailed.

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With a sigh of relief (which you will probably echo thankfully) I will at last come to "brass tacks" and indicate to you the various lines on which we are working to-day with regard to the development of new artillery material. I will start with the lighter natures and work upwards.

Before I begin on gun and howitzer, perhaps I had better say a word on the gun-howitzer question. I will give the answer first: we have practically given up the idea in common, as far as I know, with all other nations.

The gun-howitzer idea, which was mooted in our Service in 1913 and again in 1917, has certain distinct attractions, the chief of which is that which I have already stressed—simplification of supply—in that one piece would take the place of two. We have actually made one such weapon, a 3·9-inch, but I do not think that any of you would be satisfied with its performance. At any rate we are not.

Although I admit that the technical distinction between a gun and a howitzer is getting steadily and beautifully less, yet I submit that in any one class of artillery the result of a combination can only be a compromise and not a good one at that.

The essentials of a field gun are surely range, rapid traverse, handiness in action and definitely limited weight. The first essentials of a howitzer, even a field howitzer, are equally surely shell power and great accuracy.

I have tried to make it clear at the outset of my remarks that you cannot have range and shell power and low weight. Something has got to give way, with all the latest possibilities. The result is that, with a gun-howitzer, everything gives way somewhat and you get a real hermaphrodite with moderate range (according to modern standards), an unduly light shell and, probably, excessive weight in action. It seems inevitable at any rate that out of the three desirable attributes of range, mobility and power, two will certainly be inferior in the gun-howitzer as compared with the separate weapons.

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I will now proceed to deal with individual equipments[1]:—

[1] The lecturer gave details of the various new designs but these details have been omitted here.

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The new Field Gun.

This is one of our more difficult problems inasmuch as our latest type of gun, the 18 pr. Mark V, has many excellent features. Its chief disadvantages are insufficient range, as judged by modern standards, and a "weight in action" that at least borders on the excessive.

I do not want to revert to the question of range. I will only say here that, with a field gun—the stock gun of any army—it would undoubtedly have a bad moral effect if our infantry and other troops had to suffer the fire of an enemy's field artillery which our own could not reach. So here we must get more range.

Our main hope of obtaining greater range in this case is by means of an improved shape of shell. The path has proved full of stumbling blocks of one kind and another, but I hope that we shall have made our first trial of these new designs of shell before this month is out. But I am afraid that improvements in shell shape will not give us all the range we want; so, as we clearly cannot add to the weight in action, we must reluctantly be prepared to give up some degree of shell power.

When this gun was first mooted, we had in mind a maximum elevation of 70° in order, as you will guess, that the piece might be able to play some part in A.A. defence. While it is easy to exaggerate the possibilities of the air menace in the next war, and while I admit that the specially designed A.A. gun must be more efficient against individual air targets than any general purpose gun can be, yet I think that it will be generally admitted that an army in the field is likely in future to have to face air attack a good deal more than in the past. Hence it seems to me that in principle we should, in designing new equipments, always bear in mind the desirability of such a piece being able to assist the operations of the definite A.A. artillery, at any rate in an emergency.

However, we found that provision of a maximum elevation would cause such complications by reason of the necessity for rear trunnions and either springs or counterweights and consequently such additional weight, that we have been compelled to forego the 70° elevation and be content with less; a course that has, as far as my information goes, been closely followed by all other nations of importance in their studies of new field gun design.

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Reference to this subject logically forces me to mention the 18 pr. on a self-propelled mounting which many of you must have seen at manœuvres or elsewhere. The highly interesting question of the future form of traction for field artillery is not directly my province and in any case I have not time to discuss it this afternoon. I will therefore content myself with saying that, personally, I believe that there is a great future for a mounting of this type, possibly for a certain percentage of our field artillery. This mounting has 70° maximum elevation and an improved variety, which we have in view, will be able to do quite useful work against aircraft within certain limitations.

The new field howitzer.

Here our task is fairly easy, for we all know the 4·5-inch howitzer and its shortcomings, the greatest of which is insufficient range and want of accuracy.

One radical factor affecting field howitzer design is that, in my judgment, its normal tactical employment does not call for quite the same rapidity into action as must be demanded of the field gun, and hence we can afford a little more weight in action and have a box trail and a platform.

We hope to produce a trial equipment next year.

New horse artillery weapon.

Here we have a distinctly complex problem since design of a horse artillery weapon is very much bound up with the type of transport employed. I am not going to be led into any discussion as to the future of cavalry *qua* cavalry. I will only state the fact that their end is not yet, and hence I am at present concerned with the design of a new horse-drawn equipment.

The 13 pr. is an unsatisfactory weapon as regards range and power, and the bulk of evidence of both the last and of the South African War also indicates that the 13 pr. is too heavy "behind the team." That debars the use of the standard field gun, whether 18 pr. or a future design, for horse artillery purposes. But the paucity of numbers of horse artillery batteries, even in a great war, as compared for instance with field batteries, justifies us in considering the provision of a special gun for horse artillery. The one definite requirement that we have been able to lay down is that

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the weight behind the team must not exceed 30 cwt., with all sights, spanners, etc., etc.

It is possible that uncertainty as to the ultimate form that cavalry may take, may render it advisable for us to go slowly in this matter of horse artillery gun design. At any rate, we are investigating the possibilities of improving the existing 13 pr. or developing a new and improved gun of about the same shell-power.

Since results in these directions may not be very encouraging (and I am rather afraid that they will not be) we are also considering an entirely new design.

As I see the picture, horse artillery working with cavalry and perhaps tanks must be prepared to deal quickly with machine guns in the open and under light cover, and also with tanks and armoured cars. Great range does not appear to enter into the matter. Hence the horse artillery gun would probably have two charges and would really be a gun-howitzer; for in this case, as I have already indicated, a general purposes weapon is required and we can fortunately be content with moderate ranges.

If we can keep down the weight to the desired figure, we may not require either split trail or platform. If we want better traversing arrangements, the split trail is the more probable.

[The lecturer next discussed the new medium gun and howitzer, and the heavy gun.]

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Heavy howitzer.

The 8-inch howitzer came into being more or less fortuitously, and I think that most people are agreed that we do not want both an 8-inch and a 9·2-inch howitzer; besides, double provision complicates manufacture and supply, as I have already indicated.

Our original idea was to go for a 9·2-inch howitzer, on a carriage identical with that of the new heavy gun. But the split trail system having been dropped in the latter instance, we have to reconsider the position. We are now contemplating a heavy howitzer with a calibre between 8 and 9·2 inches. It may still prove possible to mount it on the 6-inch gun carriage, but not necessarily with the same requirements as regards load and axle weight.

[The lecturer next touched on anti-aircraft and coast defence equipments.]

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Close support and anti-tank weapons.

I have purposely left this matter to the last because it is in a very nebulous state. I could easily spend a whole hour in discussing the pros and cons of the whole question and of various types of possible equipments but there is no time for that; I can only deal briefly with the main issues involved.

It will clear the air if I say at the outset that no decision has been arrived at as to what form of weapon is required, if any, for close-support work or for anti-tank defence. Hence I can safely put before you my own views as to the principal factors affecting design.

I will deal briefly with the *anti-tank weapon* first.

Such is essentially a defensive weapon and it is an axiom that we should, if possible, avoid spending time and money on a purely defensive article. The tank is, however, a mobile factor of increasing importance in war and we have certainly got to arrive at some satisfactory means of coping with it.

Most of us remember the difficulties that occurred in France (and have occurred since in many staff rides) as to sparing 18 prs. for special anti-tank defence purposes. This means of defence is admittedly very limited and indeed you cannot hope to have enough divisional artillery weapons of any type to be able to dot them not only about the front but also in depth for anti-tank purposes only. In any case it would be extremely uneconomical to do so.

Thus, assuming that a special anti-tank weapon is required (and this is a matter for the highest authorities), it must in my view have a flat trajectory, adequate projectile penetration, direct laying and rapid traverse. Moreover an essentially defensive weapon should not interfere with the production of our standard offensive weapons, although, if it is decided that a special anti-tank weapon is wanted, then we shall probably want it in rather large quantities.

Thus there is much to be said for a heavy machine-gun as an anti-tank weapon, provided of course that it can give the requisite performance. Machine-gun design and production is the province of my opposite number, the D. of A. (II). I am not therefore in a position to discuss this question authoritatively. I will only remark that there will clearly be a rivalry between the heavy

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machine gun with an A.P. projectile and the tank for some little time to come.

At present, I believe that we can hope to penetrate any existing tank armour by a special machine-gun bullet at short ranges. If, sooner or later, tank armour development outstrips machine-gun progress, we shall presumably have to consider provision of a light gun. This would violate the principle of avoiding an entirely defensive weapon, and I may say that I am not impressed by such guns of this nature as are under trial by certain foreign countries.

The close support weapon is the final item of this, I fear, tedious discourse, but perhaps it is not the least interesting.

This question is one that has aroused a good deal of controversy both in this and in other countries. It is one of those problems which seem to engender heat whereas they really need the coolest and calmest consideration. I have been told by various people that this or that type of weapon, radically different in themselves, are "obviously what we want." Such diversity of view demonstrates insufficiency of clear-thinking.

Now let me review the essentials of "close support"; at least, as I see them.

I must start with a postulate:—Close support is a vague and easily abused term. What it really infers is assured ability on the part of the supporting weapons to put down quickly an accurate, i.e. observed, fire on a given point for such time as may be tactically required. Without arguing the matter out, I am quite ready to admit that we gunners cannot guarantee to fill this bill on all occasions. And why not? Primarily because inter-communication is not good enough to enable us to attain the perfectly legitimate ideal. If our divisional artillery could be sufficiently numerous, if we could spread F.O.O's all over the country, if wireless telephony was a widespread fool-proof enemy-proof certainty, then I argue that the demand for a special close support weapon would disappear.

But we have not reached the happy standards mentioned and, therefore, it may be that the demand for a special close-support weapon is justifiable to-day.

What is the issue at stake? Surely the rapid and accurate support by fire, superior to the fire of small arms, of the infantry during the late stages of an attack (culminating in the assault) from

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a stage where the constituted divisional artillery cannot, for good reasons, guarantee to deliver their fire quickly and accurately on perhaps many given spots on a divisional front.

How, then, are we going to ensure adequate support of small infantry units in the later stages of an attack against several individual objectives on a divisional front? Personally I am not wholly convinced that we cannot meet the situation by the employment of our existing artillery on the lines approved by F.S.R., Volume II, and F.A.T., Volume III. But if we cannot do so, what are the factors immediately involved?

The first and greatest point is that we have got to organise some form of close-support fire that shall, within reasonable expectation, be able to move and live in fairly close proximity to the leading infantry at the critical period of an attack. This implies, to my mind, ability to move and fire at short ranges where no horse- or even mule-conveyed artillery can hope to function efficiently. Can you honestly imagine artillery of that nature being able to move about and give effective support to infantry at ranges where the infantry themselves are tied to the ground by the intensive machine-gun and rifle fire of the defence? Personally, I can not; and so I arrive at the desiderata of a close-support weapon, if our existing artillery cannot do the work. And in this connection I inevitably invade the province of my brother-director, the D. of A. (II) :—

A specific close-support weapon must :—

(a) Be able to move with reasonable immunity fairly close behind the leading infantry. A low track transporter, with a bullet-proof shield, is therefore indicated.

(b) Even so, a stage may arrive when the track-transporter may no longer be able to advance. The weapon must therefore be capable of being removed from the transporter and of being man-handled in some way or other, from that point onwards. That is to say, the equipment must be divisible into 50-lbs. loads or less.

(c) Ammunition supply must in any case be almost a decisive factor. We must have a reasonably effective shell and at the same time remember the ultimate factor of man-porterage. An H.E. shell of about 10-15 lbs. should fulfil

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the first condition and one man should be able to carry 6-4 such shell as a last resort.

(d) A high-angle fire weapon is essential, in order that the best use may be made of any natural cover.

(e) A special weapon is in view, and we should therefore observe the principle advanced early in my lecture that we should endeavour to produce a weapon that will not tax the capacity of our regular armament firms.

What, then, should be our line of investigation?

I urge that our best course is to seek to design a simple mortar, which can be conveyed and if necessary fired from a transporter and ultimately be man-handled in close support of the infantry. It should have a shell of between 10 and 15 lbs. and must of course afford adequate accuracy of fire.

Such a weapon would not interfere with the gun output of regular armament firms, though design and provision of ammunition and fuzes would admittedly call for careful forethought. We are, with the approval of the General Staff, pursuing investigations on these lines.

If the mortar idea does not work out and if it is decided that our divisional artillery cannot give the requisite support, then we shall have to pursue other lines. Personally I should not be in favour of any half-and-half equipment, i.e. one that could effect both close-support and normal divisional artillery tasks semi-effectually. I should seek for an essentially close-support limited-range weapon and, probably, one that could combine the tasks of close-support and anti-tank defence.

I have already indicated that no one piece can fulfil both these rôles, but a single carriage might meet the case. Certain armament firms have produced designs of such a carriage, to carry either a gun or howitzer barrel, with of course alternative ammunition. I am not much taken with this idea myself as I foresee the probability, in the stress of battle, of the requisite barrel being missing at the critical moment, not to mention ammunition.

A superior idea has been developed by a well-known member of my staff, whereby both a gun and a howitzer barrel are permanently mounted on one carriage—a "Paradox" gun, if you will.

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The possibility of the wrong ammunition being at hand would still remain, and the piece would be unduly heavy for man-handling. Still, the extra weight assists the recoil question and the design has certain attractions.

I can only sum up by saying that the whole subject is very controversial and still in the air, and that for the time being the only answer is "wait and see."

* * * * * * * *

I have now finished my remarks on our present-day developments of artillery material. But I must make one final point. You will have observed that the tendency is firstly to increased range all round and secondly towards anti-aircraft co-operation. Both these tendencies seem to me to stress the importance, learnt in the last war, of avoiding parochialism in artillery control, and of exercising effective control of modern artillery for the general good, whatever the width of front in question. Long range especially favours enfilade fire and you cannot take advantage of this asset, if you confine your artillery to frontal fire. Over-centralisation of command is as much an evil as any other exaggeration. But to gain the best results from long range and to ensure inter-formation support, surely you must cater for higher command of artillery by those who are technically and tactically capable of executing it.

GENERAL BIRCH: Does anyone wish to ask any questions.

MAJ.-GENL. SIR WEBB GILLMAN: Gentlemen, I feel that we are driving away some of the clouds that we have been living in. Up till five o'clock to-day I think I am right in saying that nobody living could say what the composition of the artillery of a division would be in the next war. I do not say, of course, that they can say it now, but I do feel that what Colonel Rawlins has told us has driven away some of the clouds and has given us an idea of what we may hope to get, and I am equally sure that the Master-General of the Ordnance will expedite the manufacture of these equipments and then we will get down to trials and will see what can be done, and will base our policy and our training on our knowledge. I have listened with immense interest to Colonel Rawlins' clear statement as to the difficulty of making these equipments, the difficulties of

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range, the difficulties of weight and all these contradictory factors which complicate matters so much. I feel that we all have our opinions, and if I state my own on one or two points the lecturer must not mind. I am equally sure that half of you are quite likely to state the opposite. I feel that with the 18 pr. Mark V equipment to which he has referred we have reached the limit. There are some officers here, who have seen trained detachments work at Salisbury Plain, who say it is very easy to run up the Mark V gun. I say it is not, even with a trained detachment, and I think we must work to something less than 31 cwt. I also think that we do want to get the split trail with our field guns right through our batteries. We cannot take on tanks with Mark IV equipment, and the sooner we can find money to get Mark V's right through the Regiment the sooner I shall be pleased.

The lecturer made one remark, but perhaps I must not take him too seriously. He said that this question of range was perhaps more moral than anything else. I do not know. I think those of you who had to sit powerless while you were being out-ranged in the war had thoughts that were anything but moral. I think it is really one of the most necessary attributes of any modern gun or howitzer that it should have a long range, and we have foreign nations with equipments that carry a long way, and I do not see why we should be behind them.

One other point he mentioned to you was the question of platforms for field howitzers. I quite see that this all-round traverse is very excellent, but I think we want a little more mobility in a field howitzer than we shall ever get with a platform. I think in mobile warfare we must leave our platforms behind. When we have the new field howitzers, then, if they have not to move much by all means have a platform, but I think we must have mobility first, and we will not get it with a platform. I think that is all I have got to say, Sir.

COLONEL S. W. H. RAWLINS: I would just like to say that in the case of a platform I think things will be better than you anticipate. I think we shall get the one we have in view into action in fifteen minutes, and that with the mechanically drawn artillery

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the question of carriage will, I think, disappear. If you get fifteen minutes as the limit in action you will find it will very often be admissible, I think.

CHAIRMAN: Gentlemen, if nobody has got anything else to say, it only remains for me to close this happy meeting, and I think we will give a very hearty vote of thanks to Colonel Rawlins. He has evidently taken a great deal of trouble in getting up this lecture, and I think we shall learn something from it.

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THE FUTURE OF THE REGIMENT.

By Colonel H. Rowan-Robinson, c.m.g., d.s.o.

1. Opinion and experience in the mechanisation of armies are now sufficiently consolidated to enable some stock to be taken of the future of artillery. It is proposed, therefore, to consider how far the present organisation and equipment fits the existing situation, on what lines development is likely to take place and how the personnel of the regiment will be affected by that development.

2. The object of an army is to win battles and to profit by them. Infantry is still held to be the decisive arm (F.S.R. II, sec. 13). The energies of the other arms are therefore directed towards enabling it to close with the enemy and deliver the *coup de grace*; the guns cover the advance from afar; the tanks support it closely. In the pursuit cavalry still holds pride of place and is supported by horse artillery and by armoured cars.

3. Evolution in the artillery has apparently kept pace with the demands made upon it, being suitably armed and equipped for the tasks mentioned above, and its mechanised brigades being available to act if need be with a mechanised division.

4. Certain disquieting symptoms are, however, obtruding themselves on the notice of observers, casting some doubt on the advisability of continued development on present lines:—

(a) At recent manœuvres, both British and Indian, successful attacks on marching columns by armoured cars, against which cavalry furnished no real security, forced column commanders to disperse their artillery by single guns at the head and flanks of columns, watching all approach roads. These guns required infantry escort. Guns and infantry dropped in driblets from the head of columns naturally caused much disorganisation in their respective units. Against attacks made by tracked or half-tracked vehicles such piquetting requirements would need large increase and would seldom give complete security. Thus

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it is seen that to deal with an attack by mechanical vehicles on the march, protection is required, which can be given satisfactorily neither by cavalry, infantry nor artillery. For this purpose a dragon-drawn gun possesses no advantages over a horse-drawn gun. The tank furnishes the only suitable antidote.

(b) The next disquieting symptom is the great variety of opinion in the Regiment and elsewhere on anti-tank defence. Military magazines but rarely omit some reference to the subject. The methods recommended are—the use of infantry weapons; close support pack howitzers; forward guns, concealed and kept silent till required; artillery distributed in depth. The infantryman looks mainly to the gunner to tackle the problem; neither gunner nor infantryman is sure that the solution has been found. The 3·7″ howitzer is under suspicion; it is a good close-support weapon but weak against tanks. A big tank attack against a brigade front will not be held up by four 3·7″ howitzers which, if under cover, will be ineffective and, if in the open, will soon be destroyed. The forward guns will cause more casualties but do not furnish an ideal solution. They break up units; they detract largely from the artillery strength available for general operations, and some of them are certain to be sited in positions from which they cannot act. Distribution of batteries in depth offers no brighter prospect. Picture the situation:—Tanks have broken through along a whole divisional front. The artillery, distributed in depth from 1000 yards to 3000 yards behind the infantry, sees them mingled with friendly troops, appearing over crests and disappearing into valleys, rattling rapidly along, some getting knocked over, others getting quickly nearer, the invisible ones multiplying largely in the minds of men. The first line of guns is passed and then the second. Guns now are firing in every direction. Enemy tanks are mixed up with friendly guns, gun-teams and dragons. Friendly tanks arrive (F.S.R. II, sec. 108) and move to the counter-attack. Reinforcing artillery dash into positions previously reconnoitred

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(F.S.R., sec. 94 (8)). What confusion! A jumble getting more and more tragical till the last line is passed. Would not the counter-attacking tanks have had a far better chance alone?

It is not pretended that tanks will have it all their own way. Guns will sometimes have a tremendous success against them—as at Bullecourt and at Flesquières. Tanks in fact will always suffer considerably from artillery fire but, unless employed in small numbers or on unsuitable ground, will generally win a way through. The only answer then is an immediate counter-attack by tanks. The dragon-gun possesses no advantage over the horsed gun for anti-tank work.

Thus for two of our immediate requirements—protection on the march and anti-tank work in battle—the gun inside the tank is to be preferred to the gun outside it.

5. Now for the future: The eventual mechanisation of an army that may have to engage in European warfare is certain. Once war has begun and the whole resources of nations are thrown into the struggle, the rate of mechanisation will be very rapid. Progressing on the lines of our existing policy and in the absence of war, we shall, say, in fifteen years' time, have mechanised the whole of our horse, field and medium artillery, that is the guns of all these branches will be dragon-drawn. During that time the mechanisation of the rest of the army will have proceeded apace. Neither bayonet nor sabre will then be decisive weapons; they will have been supplanted respectively by the slow-moving tank and the fast-moving tank. Infantry and cavalry will still exist but only as auxiliary services: for the attack and defence of tank harbours; for action in ground naturally unsuited or rendered unsuitable for tanks, infantry being brought up in buses to occupy, with protected flanks, villages, woods and river lines and thus economise tanks for action elsewhere, cavalry being used as ground scouts to tanks in difficult country and for protective and independent action in country not passable by tanks. Generally speaking, the battle will then have lost many of the attributes of present land-warfare and will closely resemble a naval action.

6. How will the dragon-gun fit into this picture? He cannot accompany the auxiliary cavalry and infantry except in the attack

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and defence of tank-harbours—for they only operate over ground impassable by tracked vehicles. He cannot hope that enemy tanks will line up along a defensive position to give him a target. If he engages enemy tanks in the open he will be destroyed, for alone on the battlefield the human flesh of his crew is exposed unarmoured to bullet and splinter. What then can he do?

(a) He can deal with enemy auxiliary troops posted in tank-free ground by normal methods, but the fact of his having been able to reach a position to effect this presupposes the possibility of his being attacked by tanks in that position.

(b) The approach of enemy tanks having been reported by aeroplane, he drops into action. The C.R.A. ascertains the plan of the force commander. Artillery commanders from battery commanders upwards take to the air. Zones in the probable areas of approach are allotted to brigades (or batteries in the case of small forces). Zero lines and useful points are registered. The C.R.A. directs fire in accordance with the commander's plan as the action develops.

This method is clearly impossible unless artillery officers of all grades can command from the air, for the current of events will run too fast for ground direction. It postulates the definite allotment of aeroplanes to artillery units—a policy not yet adopted. It demands a high standard of training; and, finally, it is unlikely to give important results except in the creation of smoke barrages.

(c) On receiving aeroplane reconnaissance reports, the Force Commander orders his C.R.A. to place smoke barrages to conceal his movements while he operates against the enemy.

This is a simple and effective method but does not justify the utilisation of a large force of artillery for its execution. Tanks, discharging smoke from their exhausts or, if wind is unfavourable to the latter method, firing shell from projectors in the body of the vehicle, would obtain similar results more cheaply.

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(d) In combination with (a), (b) or (c), guns are pushed up into concealed positions in the open to deal with tanks over open sights.

This, as stated above, entails a dispersal and a diminution of the general artillery effort.

There are thus strong objections special to each of the methods indicated; but there are two further objections which are common to all and which practically bar the use of dragon-guns in the tank battle: the first is that once the battle is joined it will be impossible for the artillery to distinguish friend from foe, for, apart from dust and the mingling of the combatants, both sides may cover themselves with smoke while still far apart. The second is that escort for the guns will be continually needed throughout the action—a waste of valuable fighting forces. Moreover, the tank-battle will end with the victory of *les residus sur les restes*; and *les residus* will mop up the guns of the loser in spite of the escort.

War policies are largely a matter of £ *s. d.* If there are fewer guns, more tanks can be purchased. Again, where there are no guns, no escorts are required, and therefore more tanks are available for battle. In a tank action, which would a commander prefer—the covering fire of a brigade of artillery or an extra battalion of tanks?

A few dragon-guns would be useful—for the attack and defence of tank harbours; and in quickly breaking down resistance in houses or other strong points; but they should be limited to two per tank battalion and be included in the battalion organisation.

7. As the dragon-gun is clearly not the weapon of the future, a solution must be sought elsewhere. There is an experimental equipment under trial at present—an 18 pr. gun mounted on a tank. Here is a weapon that can fire at rest or on the move, can act as a flank guard without disorganising its unit and might be used for anti-aircraft work if suitably designed. On the other hand, it is cumbersome, expensive and heavy on bridges. If armoured, its weight is prohibitive; unarmoured it requires escort—an escort of tanks—and if caught unescorted its capture entails heavy financial loss. Again, what will be its targets? Mainly tanks. And if a 3 pr. will disable a tank why use an 18 pr? The easier carriage of rounds for the former alone suffices as a reply.

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8. Thus whatever form of argument is followed, the old platitude recurs "The proper antidote to the tank is the tank." In the tank-battle, the proper place for the gun is inside the tank and it should be sufficiently large to disable another tank and no larger. The dragon-drawn gun, the gun or howitzer of field calibre mounted on a tank, are both moves in a false direction.

9. Even with an army fully mechanised there are, however, certain requirements for artillery other than anti-tank action. Take the field requirements first:

It has been said that there will be certain infantry and cavalry auxiliaries. These auxiliaries will need artillery support—which may take one of several forms:—

(a) The barrage of tank approaches into defended areas.

For this purpose any available guns will suffice—a matter for improvisation.

(b) The support of infantry holding lines or portions of lines impenetrable by tanks.

Here artillery is required with the mobility of embussed infantry, i.e. the guns must be carried in lorries and taken into position by hand, either light field guns on wheels or pack guns in two or more pieces being suitable. Again a matter for improvisation.

(c) The support of infantry or cavalry operating in country unsuited to tanks, or where tanks are unlikely to be encountered.

An important requirement mainly in the province of pack artillery. All our Indian pack brigades will have to be retained, and, for a long time to come, some of our field brigades in India.

(d) The attack and defence of tank-harbours.

For defence the dragon-guns of battalions will be utilised. As to attacks, as they would generally be made at night, guns would but rarely be required for their support.

(e) The attack and defence of fortresses.

However well supply-tanks may be able to cross country, the normal form of supply for an army, even a mechanical army, will be by rail; and, even if amphibious

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tanks can be built, rivers will normally be crossed at the bridges. Hence fortresses or defended areas blocking approaches and river passages will still be held. They may be isolated by tanks and bombed by planes but, if resistance is serious, these instruments will pass on to other functions and leave the reduction of the place to the process of a regular siege, for which heavy and medium artillery would be required. For this purpose a siege train could be formed from the medium and heavy batteries now in coast defences.

10. Coast-defence artillery will still have to be maintained on lines similar to those now in existence though in a somewhat diminished form. It may possibly be supplemented by reprisal-guns—weapons emplaced to respond to long-range bombardment of towns and harbours.

11. The importance of anti-aircraft guns is greatly increasing. The menace from aircraft spraying gas or dropping bombs on the seat of government, on centres of industry and on terminal ports, is now the gravest to which this country is exposed. It can be countered to a great extent by a large increase in our air force; but aircraft will never be able to counter aircraft as a fleet can counter a fleet. There must, therefore, be solid anti-aircraft organisations at each of our principal terminal ports, for there it is that our food arrives and from there our food is distributed. The prolonged cancellation of the activities of these ports by a persistent gas might soon bring us within reach of starvation even though the navy had swept the seas of enemy cruisers and submarines. Aircraft and anti-aircraft organisations have in fact replaced the navy as our first line of defence. Anti-aircraft work can be undertaken largely by territorials for it will be required at places where populations are large, and the inhabitants will naturally be much interested in their own protection. But it is a complicated affair and only useful if thoroughly efficient. It requires, therefore, a strong backing of regular officers and specialists.

12. In the field, too, the importance of anti-aircraft services will steadily increase. The stationary defence of bases, depots, etc., will be organised on the same lines as those at home ports, regular troops, however, being employed. The mobile guns in the field

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will form an integral part of tank battalions, at the rate, say, of four to each battalion. Their vehicle will not differ much from the ordinary tank.

13. If that be the future of the gun, what then is the future of the Regiment? During its long history the proportions of the constituent parts—horse, field, siege and pack—have suffered many changes. The future is to see its composition and functions altered in a far more radical form. Some 90% of the horse, field and medium artillery will disappear; a small number of medium and heavy batteries charged with the dual function of coast defence and oversea sieges will remain; pack artillery in England will be abolished, that in India retained; mobile anti-aircraft units will be absorbed into the Tank Corps; stationary anti-aircraft services alone will undergo a big increase.

14. Taken on the whole, the prospects are extraordinarily unpleasant; hardly a redeeming feature can be distinguished. Practically the only mobile artillery left will be the Indian pack brigades, and the immobile artillery will be more immobile than ever. If, however, the premises on which this paper is based are correct, that is the situation to be faced. How then is the wind to be tempered to the shorn lamb.

15. When complete mechanisation is effected, the Tank Corps will cease to exist. Having absorbed the Army, the Army will in turn absorb it and will contain in addition certain auxiliary Cavalry Artillery, Infantry, Engineers, Army Service Corps, etc., so far as they may have been found necessary in the mechanical order of things.

16. Now all new armies and most other new organisations suffer from the absence of the spirit that springs from old and splendid traditions. There are brilliant exceptions—Cromwell's New Model Army, for instance, inspired by puritan fanaticism and high leadership, was a fine instrument of war—but they are few in number. How shall we then inspire this new mechanised army with the spirit of the old army that it will have supplanted?

17. It has been shown that the organisation and equipment of the Regiment is fairly well adapted to the exigencies of the existing situation but is ill-suited to the contingencies of the future. Changes will have to be made in the direction indicated in this paper *pari*

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passu with the progressive mechanisation of the army. Mechanisation of the artillery need hardly continue; or if, owing to early doubts as to the correct policy, it does continue, it should proceed slowly and on the cheaper lines of half-track tractors. Once future policy is definitely settled it should work on clear-cut lines. It may be decided, let us say, to raise a battalion of tanks every year and that every third year the funds for the formation shall be found by the disbandment of a brigade of artillery—or whatever the financial equivalent in guns may be. Let these brigades in turn be transferred wholly to the mechanised army and become Artillery Battalion No. 1, Artillery Battalion No. 2, etc., field and medium artillery units manning tanks which contain guns, and horse artillery armoured cars or quick-moving tanks. In this way the high professional value of the services of the officers and men of the old army will be retained and the spirit and tradition of the Royal Regiment will be born again in new surroundings.

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ANTI-AIRCRAFT ARTILLERY.

Case II as a Method of A.A. Fire Control.

By Colonel H. W. Hill, C.M.G., D.S.O.

UP to the present time, very little attention has been directed to the employment of Case II as a method of A.A. Fire Control, but it can be shown that on many occasions the use of Case II as compared with the use of Case I is likely to prove far more efficacious.[1]

The essential difference between Case I and Case II as methods of A.A. fire are as under. In Case I, a vertical deflection to allow for the travel of target is set on the telescopic sight which is then laid on the target, the required tangent elevation for the ordered fuze range being given by means of the fuze range dial. During a series all bursts should be on the line of sight, but will be at different heights if changes in the angle of sight occur during the period of gun fire. In Case II, quadrant elevation is given to the gun by means of a Q.E. plate which is graduated in terms of height and fuze (or other suitable factors). During a burst of gun fire all rounds are projected to the ballistic height ordered, no attempt being made to obtain bursts on the line of sight.

With a view to determining the relative merits of the two systems of fire, diagrams[2] have been prepared to illustrate the probable results to be expected under various conditions with the present 3″ 20 cwt. A.A. gun. The whole question is highly complicated as many variable factors are involved, but from the diagrams it will be seen that there are many occasions on which Case II *ought* to be used; that on certain occasions Case I should give far better results; and that there is an interim zone in which Case I and Case II should be equally effective.

When Case I is employed as a method of fire, the following data are required:—

[1] A short reference is made on page 75 of the "Manual of A.A. Defence, 1922," to Case II, but its value and its limitations are not discussed.

[2] In diagrams Nos. 1 & 2, all bursts for Case I are shown as being in the line of sight. There are at present no A.A. Instruments in the service which actually give these results during 4 rounds of gun fire.

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(1) Ballistic Height
(2) Vertical Deflection. } Hence fuze range from the H.F.I.
(3) Lateral Deflection.

Of the above, the vertical deflection is always the most difficult to obtain correctly. This is due to the fact that the vertical deflection often alters rapidly whilst the laws governing these changes are decidedly complicated. If the vertical deflection is given incorrectly, two errors occur; one being that all the bursts are (theoretically) off the line of sight, the second that the order to open fire will not be given at the correct time. Of these, the first is the most serious as it affects every round of the series. The second error is not so serious as it is often neutralised by the duration of the period of gunfire. During gun fire, the change of range may amount to 400 yards.

This change of range will—for a directly approaching target travelling at 100 miles an hour at a height of 12000 feet and fuze range of 22—cause a change in angle of sight amounting to about $1\frac{1}{2}$ degrees. If therefore an error of half a degree is made in ordering the vertical deflection, this error will be too small to render the series ineffective from a consideration of the time at which the order to open fire was given, but as the mean point of all the bursts will be half a degree off the line of sight it will be shown that the chances of hitting, if Case I is employed, are very greatly reduced.

In the above particular example which is graphically reproduced in Diagram No. 1, it will be noted that, assuming there were no gun or fuze errors, the bursts would be distributed over a height zone of some 600 feet. This latter fact materially reduced the possibility of obtaining hits if Case I is employed as the method of fire.

When Case II is employed as a method of fire, the same data are required as for Case I, but the absolute accuracy of the vertical deflection is not so essential as all rounds will be projected to the ballistic height ordered (neglecting for the moment the gun and fuze errors). An error, therefore, of half a degree in obtaining the vertical deflection and hence the correct time at which fire is to be opened may not result in a serious diminution of the effect of the series.

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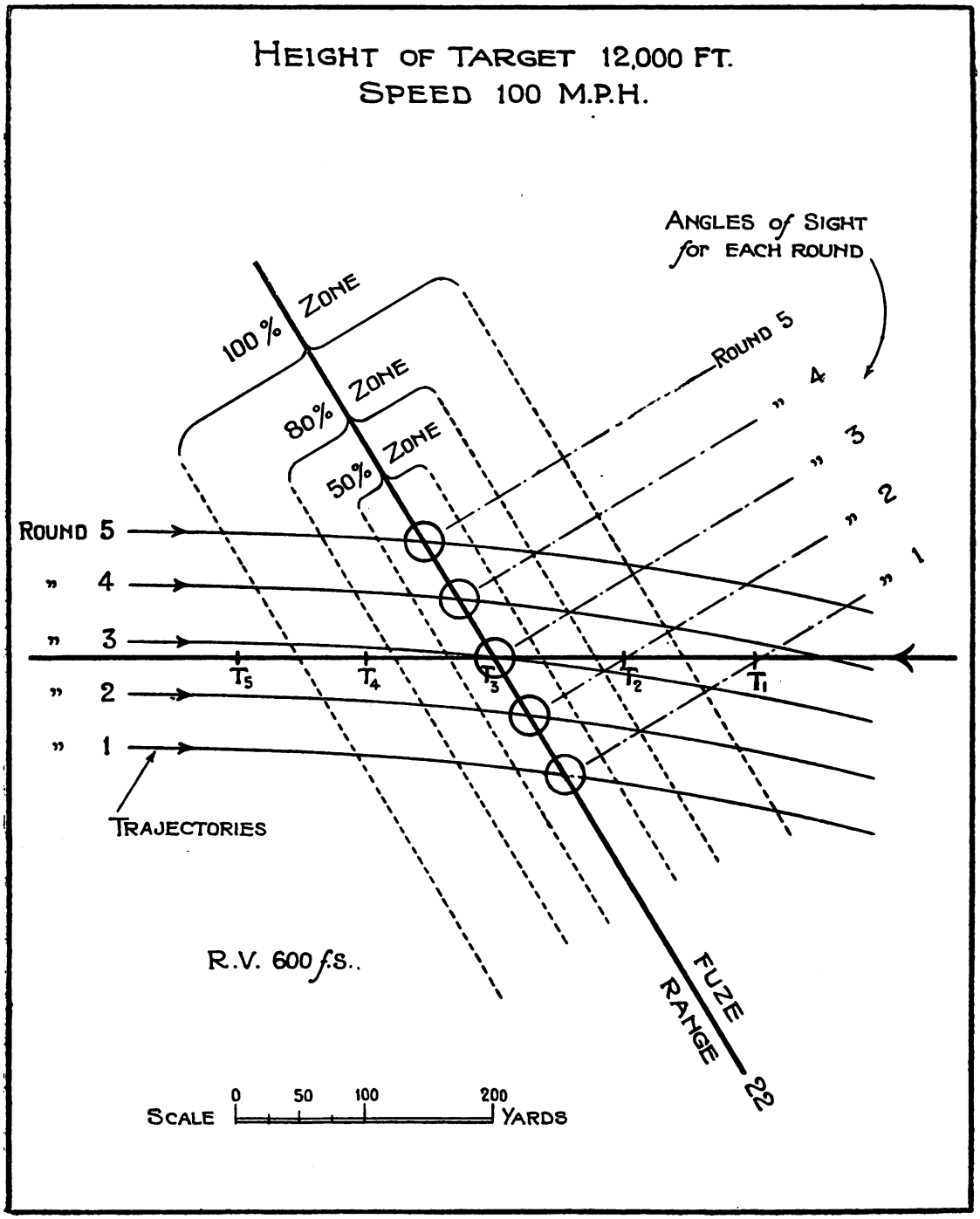
DIAGRAM Nº 1.



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The effect of fuze error will now be considered. A mean error of fuze of 0·20 seconds will be taken when comparing the two systems of fire. (It is realised that fuzes having a mean error of as much as 0·50 seconds were passed into the service during war time, but with fuzes having such outrageous mean errors it is impossible to devise any efficient system of A.A. fire control. With such fuzes about 70% of the ammunition would be fired without any reasonable hope of success, and the value of accurate A.A. fire control instruments reduced to a minimum).

At long ranges the average remaining velocities are about 600 f.s., except when fired at very high angles of sight. Taking the mean error as 0·20 seconds, the bursts will be distributed along the trajectory over a distance of about 260 yards; the 50% zone being about 65 yards, and the 80% zone 130 yards in length.

The above figures have been made use of when drawing out Diagrams Nos. 1 and 2; these diagrams enable the comparative merits of Case I and Case II to be investigated.

In Case I, the first round is taken to burst when the target is at T.1. The mean point of burst is indicated by the circle on the trajectory of Round 1. The mean points of burst of Rounds 2 to 5 are similarly shown. The lines of sight to the target are shown by the chain dotted lines. The small circles in the diagram are 50 feet in radius and represent the radius of effect for a burst; it is optimistic to hope for much effect beyond this distance although there is a danger zone extending beyond it, particularly along the trajectory, as the fuze which weighs over $1\frac{1}{2}$ lbs. constitutes a formidable missile.

In the diagram there is only one trajectory, that of Round 3, which is likely to produce effect. It will be seen that conditions here are distinctly adverse to the use of Case I. If, however, Case II had been employed all rounds should have been on a trajectory similar to that of Round 3 (neglecting gun errors) and possible hits might have been obtained when the target was at T.2, T.3, and T.4; i.e., three rounds might have produced effect.

It will now be assumed that the first round of gun fire had been opened one second later, that is to say when the target was between T.1 and T.2, the other rounds also occurring at the intervals. Under these circumstances, two out of the four rounds using Case I might have been effective; whilst with Case II, three or possibly four

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rounds might have been effective.

If, therefore, 4 rounds of gun fire had been fired from a section of two guns and the rounds had been fired at regular intervals of one second, the most favourable expectation of effective rounds with Case I would be 3, and with Case II, 6 or 7.

It is important to remember that this comparison between the relative efficiency of Case I as against Case II only holds good when the vertical deflection has been ordered correctly. The effect of an error of 25 minutes can be deduced from Diagram No. 1. In this example, the change in angle of sight between successive rounds is about 25 minutes. If, therefore, the vertical deflection ordered had been 25 minutes too much, the effect, using Case I, would be that when the target was at T.1 the burst would be as for round 2; when the target was at T.2 the burst would be as for round 3, and so on. It is obvious that such an error when using Case I reduces the chance of hitting enormously.

If the same error in the vertical deflection had occurred when Case II was being used, *there would have been no change in the trajectory*, but the first round of gun fire might have been bursting when the target was at T.2, or 100 yards short of T.1; the really dangerous zone which is between T.2 and T.4 would in both cases have been efficiently covered and so the loss of effect should be almost negligible.

It will therefore be seen that for the particular type of example selected, the expectation of getting hits with Case II is considerably greater than with Case I even when the vertical deflection has been correctly ordered, and that if an error amounting to half a degree has been made in the vertical deflection, Case II should still give good results although Case I would probably be almost ineffective.

An example will now be taken in which the conditions are unfavourable to the use of Case II. Diagram No. 2 illustrates the same target as in Diagram No. 1 but at a later stage of the attack. The angle of sight is about 65 degrees and the fuze range 11. It will at once be noticed that the trajectories intersect the line of travel of the target at a wide angle; (in Diagram No. 1 the trajectories were nearly parallel to the course of the target). In this example, the angles of sight for each round are not shown as they are almost coincident with the trajectories, the divergence being only about

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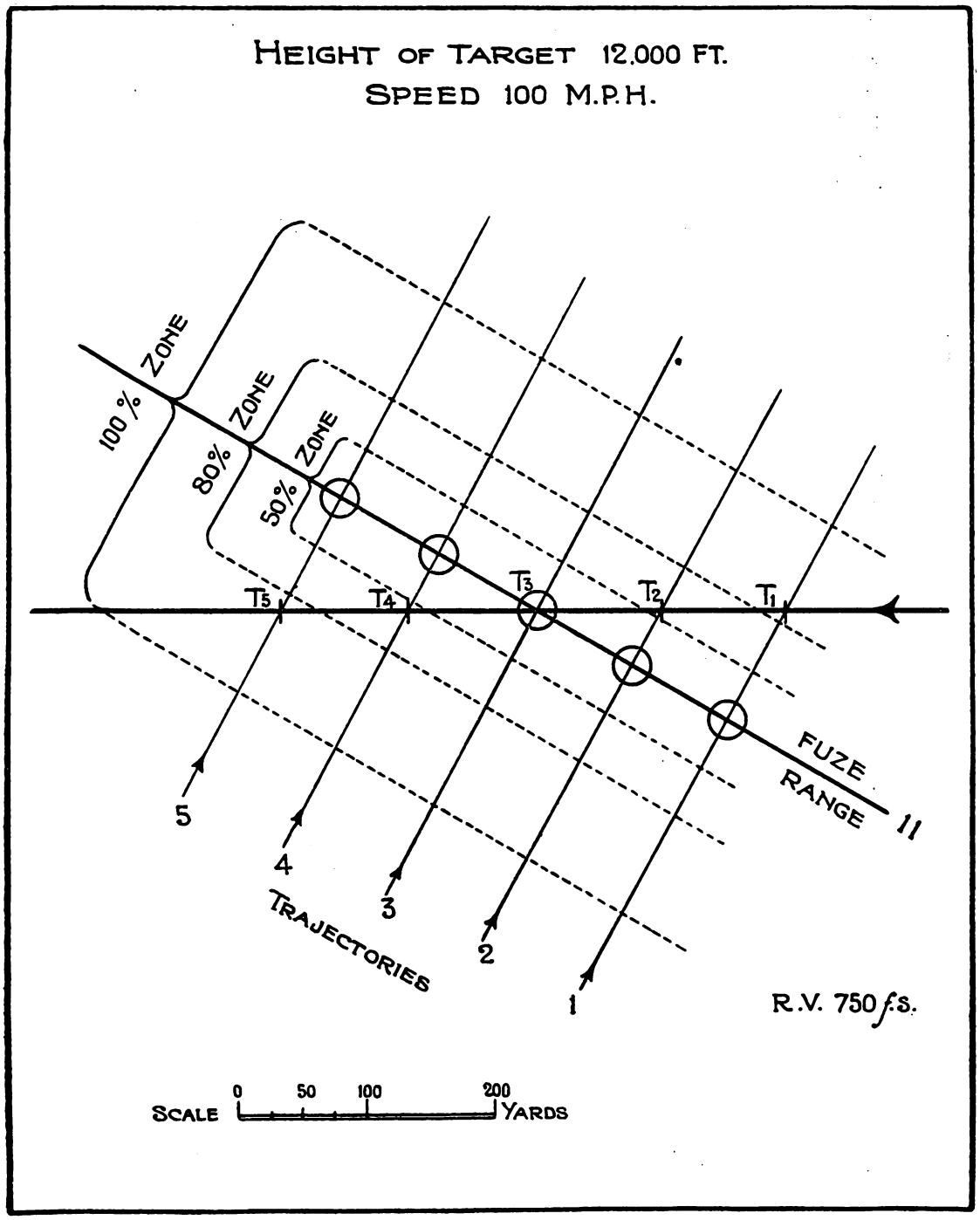
DIAGRAM Nº 2.



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4 degrees. It will be seen that if Case I is employed and the vertical deflection correctly ordered, all rounds may possibly be effective; whilst if Case II is employed only one round is likely to be effective as all rounds will be fired with the trajectory as shown for Round 3. It should, however, be noted that an error of half a degree in the vertical deflection would render a series fired with Case I ineffective whilst with Case II there would still be the chance of getting one hit.

In Case I there is a very large height zone made up of (a) the successive increases of height from round to round due to change of angle of sight, this amounts to about 600 feet; and (b) the dispersion of the bursts along the trajectories due to fuze error, this dispersion for a fuze error of 0·20 seconds may amount to ±450 feet. In Case II, no height zone due to (a) is involved.

The general conclusion to be derived from Diagram No. 2 is that Case I is far preferable for this type of shoot provided that the vertical deflection is likely to be correct to the nearest half degree, but if there is doubt as to the accuracy of the vertical deflection the use of Case II should ensure a certain amount of effect.

The relative merits of Case I and Case II in the attack of crossing targets will now be considered. Diagram No. 3 is a plan projection of various fuze ranges with their 80% zones for a height of 10,000 feet. The fuze zones shown have in reality various tilts as can be seen in Diagrams Nos. 1 and 2; these tilts cannot be conveniently shown diagrammatically, but their effect at short ranges is to reduce the efficiency of Case II as a method of fire. This diagram should be studied in conjunction with the fuze chart diagram.

Four target courses have been drawn in to illustrate various conditions of attack. Against a target on course (1), an attack could be made with fuze 16 over a distance of travel of target of 500 yards, all rounds being possibly effective as the target remains within the 80% fuze zone; shortly after, the target can be attacked with fuze 15 over a distance of 2000 yards while it remains in the 80% zone of fuze 15. During both these attacks, Case I or Case II would be almost equally suitable as methods of fire, provided that in Case I the vertical deflection and the changes in vertical deflection had been ordered correctly. The use, however, of Case II

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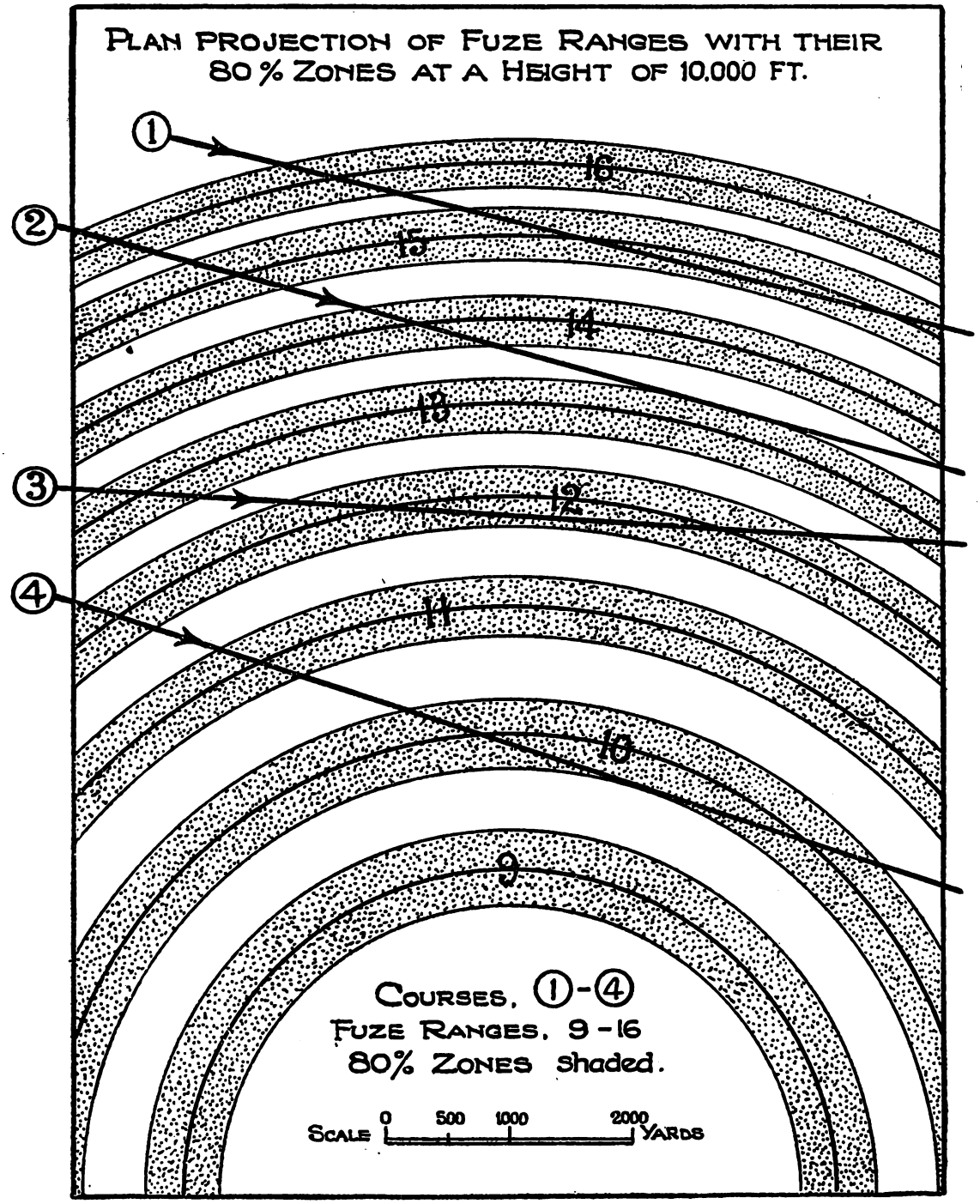
DIAGRAM Nº 3.



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would have eliminated possible errors in these orders and is for that reason far preferable.

An aeroplane flying on course (2) could be conveniently attacked with fuze ranges of 16, 15 and 14; after that there is a period during which the target whilst travelling a distance of 2000 yards is almost immune from A.A. fire as it is about half way between the fuze ranges of 14 and 13. To obtain effect during this period it would be necessary to fire with fuze $13\frac{1}{2}$. This of course means setting fuzes during action and obtaining elevation by interpolation. This could be done equally inconveniently by either Case I or Case II.

Targets on course (3) could be attacked almost equally well with Case I or Case II. The advantage of using Case I is that the trajectories of shell bursting on the line of sight should be closer to the target; the disadvantage of Case I is that there are a number of small changes in the vertical deflection which have to be ordered to keep the bursts on the line of sight.

Targets on course (4) when reaching fuze range 10 are better dealt with by Case I, as at short ranges (when combined with high angles of sight) only a few of the trajectories using Case II are sufficiently close to the target to warrant the use of Case II.

For crossing targets at fuze ranges greater than 15 it is generally far preferable to use Case II (except at angles of sight over 60 degrees), the reason being that at these long ranges the trajectories in the neighbourhood of the target are more nearly horizontal.

The examples shown in the three diagrams comprise the principal types of attack that have to be considered: all other courses are merely variations of the above. But before making definite recommendations as to the occasions on which Case I or Case II should be used, it seems advisable to ascertain the influence of height errors and gun errors on the two systems.

There are two forms of height errors, the height error due to the gun, and the height error due to the height finding instrument. No definite figures can be laid down for gun height errors: the best figures available are those reported from the A.A. Practice Camp at Hunstanton in 1924, on this occasion the average total dispersion for the six guns calibrated was 300 feet at 12,000 feet. In the previous year, the dispersion amounted to over 1000 feet.

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It seems probable that a height variation of some 2% or 3% due to gun error would afford a satisfactory basis for discussion.

The mean height error for the U.B.2 against moving targets has not as yet been satisfactorily determined, but it seems unlikely that the height as determined from the mean of three or four observations should, up to heights of about 12,000 feet, at long ranges, be in error more than 3% when taken by highly trained men.

The general impression that I have formed is that the combined height errors of a group of two A.A. guns already produce a sufficiently large vertical zone to enable small errors in height finding to be discounted, and I think it is far more necessary that steps should be taken to improve the accuracy of the gun (or more correctly of the ammunition) and so obtain a more concentrated belt of fire rather than to adopt a policy of further scatteration of the type that must occur when Case I is used against advancing targets.

One of the so-called advantages of Case I is that errors of height finding are taken up by the vertical zone established by the successive bursts; the zones in Diagrams 1 and 2 which do not include gun or fuze errors, are about 600 feet in height. But it would be more correct to say that the chances of obtaining effect are equally small whether the height is well and truly found or is only approximately correct; this remark does not apply to crossing targets as for these targets no vertical belt of fire is developed. The fact that no attempt has ever been made to arrange a vertical belt of fire when dealing with crossing targets shows clearly that there is but little belief in the beaten height zone theory. At the present time the beaten zones for a gun-fire period of 8 seconds vary from about 800 feet to zero and depend solely on the height, speed and course flown by the airman; the zones are in no way predetermined by the A.A. gunner.

When Case II is employed under favourable conditions, the result of accurate height finding is materially to increase the chances of obtaining effect. If, however, the height has not been accurately taken, the effect for a particular burst of fire should be almost nil; but the fact that the height was in error would probably be detected by the general manœuvre of the target; subsequent bursts of fire with a corrected height might prove effective.

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It is quite admitted that it is open to argument as to whether or not a *definite* height zone (additional to the height zone caused by gun and fuze error) should be employed. Should it be deemed advisable to do so, this can easily be arranged with Case II, as alternate guns might be given slightly differing heights; or alternatively, the scale of heights on the Q.E. plates might be arranged so that one gun always had the ordered height plus 100 feet, the other gun the ordered height minus 100 feet. It will be seen that the use of Case II enables a *predetermined* height zone to be employed. This appears to be a strong argument in favour of Case II. This last remark may appear to be somewhat contradictory to the opinion previously expressed that the belt of fire was already too dispersed, but when gun and fuze errors are reduced it should be possible, especially when A.A. guns are used in groups of four, to establish definite beaten zones rather than to rely on the promiscuous effect that is inevitable when gun and fuze errors are of considerable magnitude.

The next point for consideration is, "On what occasions is it advisable to use Case II"? It is difficult to lay down hard and fast rules that would be acceptable to all A.A. gunners as there are a number of occasions when equally good results should be obtained by either Case I or Case II, provided that the vertical elevation for Case I was known to be accurate. It is, however, extremely advisable that hard and fast rules should be laid down so that the selection of the method of fire should be practically automatic thus preventing a cause of delay in opening fire. It is, therefore, proposed to suggest certain limitations with a view to their being discussed and modified by the Air Defence School.

The following conditions are suitable for the employment of Case II :—

(1) When the angle of sight is under 40 degrees.

(2) At all fuze ranges over 16 up to 60 degrees angle of sight.

(3) At crossing targets up to 60 degrees angle of sight.

These proposed limits have been enclosed by a chain dotted line on the fuze chart diagram. I am of opinion that more than 70% of all A.A. shooting is comprised in that area. The dominating factor in assigning limits is the inclination of the trajectory to the horizontal; the best chances of obtaining effect occur when the inclination is small.

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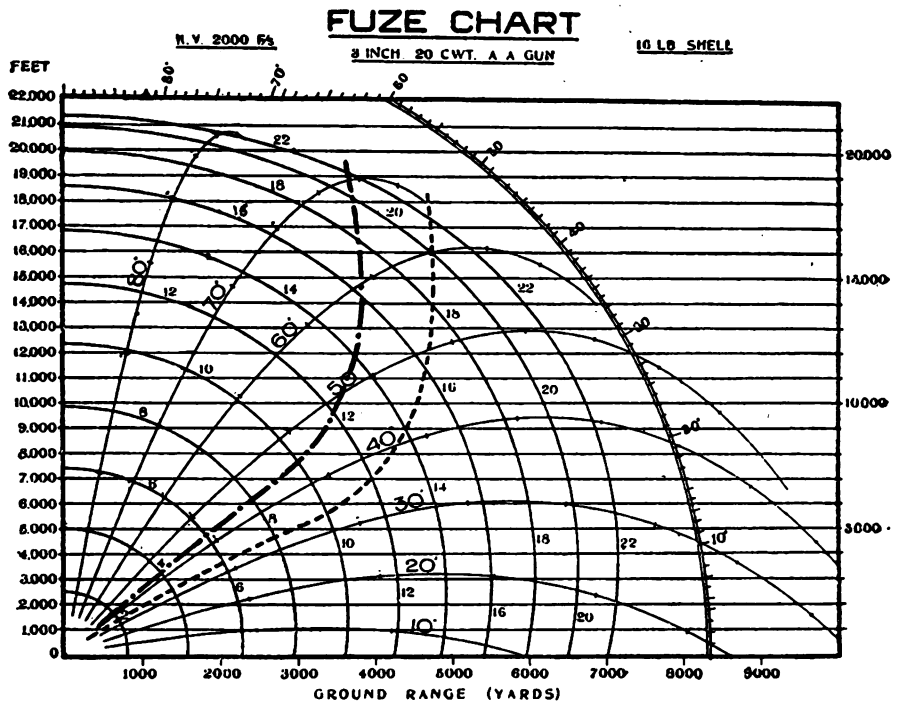

A study of the fuze chart diagram shows that there are very large areas over which the trajectory has but a small inclination to the horizontal. On all trajectories up to 50 degrees Q.E., there are distances varying from about 1000 yards to 2000 yards in which the actual change in height is less than plus or minus 100 feet. In fact on every trajectory of every gun, howitzer or rifle, the change of height for the period of 7 seconds during which the projectile is within $3\frac{1}{2}$ seconds of the vertex is approximately 200 feet (i.e., $\frac{1}{2}$ gt^2 for $3\frac{1}{2}$ seconds). This 7 seconds multiplied by the average remaining velocity of the shell gives the actual distance along the trajectory in which this slight height variation takes place. It is obvious that this is a fact of great importance and that full use of it should be made in A.A. gunnery. In Case II all possible use is made of this fact, with the result that there is a distinct chance of obtaining direct hits even when the fuze range is incorrect. It might be considered that direct hits in A.A. shooting were hardly a practical proposition, but even if the chance of hitting was 2000 to 1 it is eminently worth considering, as on the average in France in 1918,

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it took 4500 rounds to bring down one plane. Under these circumstances a 2000 to 1 chance appears positively rosy, as for every 4500 rounds fired, two or more planes might be brought down.

As a matter of fact, if accurate instruments become available and if errors in ordering vertical deflections are eliminated, the odds against getting a direct hit should be materially reduced.

Now assuming that Case II were accepted as a method of A.A. fire control and that a boundary line somewhat similar to the chain dotted line shown on the fuze chart diagram had been decided on, it would be a comparatively simple matter to have such a line engraved on the height fuze indicators. If this were done, there would be but little time wasted by the Officer controlling the fire in making up his mind as to which method of fire control was to be employed.

The chain dotted line is the one suggested for use with the present service (Brocq) system of obtaining vertical deflection. This system has not proved satisfactory as it is not reliable, although on occasions it has produced good results. If the Vickers or some other mechanical system of obtaining fuze ranges and vertical deflection should be adopted, and proved thoroughly reliable, the chain dotted line might be altered to the position shown by the dotted line on the same diagram. But however reliable any new system of obtaining vertical deflection might be, it will always be far preferable to employ Case II for targets in the area bounded by the dotted line as full use is then made of the trajectories where they are but slightly inclined to the horizontal.

The type of spotting corrections to employ when using Case II requires consideration, as but few bursts can be expected on the line of sight.

If the vertical deflection is correct and if fire is opened about 4 seconds before the fuze range curve is actually in contact with the pointer of the H.F.I., there should be an equal number of rounds in front and behind the target. If, however, the vertical deflection on the H.F.I. is too small, the majority (or all) the bursts will be behind the target. The amount that the first round should be in front of the target is roughly about a quarter of the vertical deflection ordered for the H.F.I.

If there are an equal number of bursts in front and behind the

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target (or a slight preponderance in front of the target) and the target makes no change in course or in manœuvre, it might be assumed that a height correction was advisable.

The use of Case II in defended areas in which a master height has been ordered enables height corrections to be more easily determined as all rounds will tend to be at one height. In Case I there is a distinct difficulty in obtaining height corrections even when good distant observation is available, for two reasons; one being the vertical distribution of fire previously referred to, the second is due to the fact that an error in ordering vertical deflection or a delay in opening fire will—even if the master height is correct—give the appearance of the height being in error. This can be shown by a reference to Diagram No. 1. If fire is opened when the target is at T.4 (i.e., a delay of about 7 seconds), the first round, if the vertical deflection had been correct, would burst as for round 4 and all subsequent rounds much higher. If Case II had been employed, the trajectories of all the rounds would have similar to round 3, a distant observer might have reported height correct but all bursts behind the target.

The method of applying wind corrections when employing Case II should be considered. A study of wind correction diagrams shows that in the majority of cases up to a time of flight of 20 seconds, a wind correction applied to the H.F.I. should give satisfactory results. For longer ranges and for heights under 10,000 feet, it may be necessary to apply a height correction to the Q.E. plate.

The present[1] 3″ 20 cwt. H.A. mounting is not convenient for the employment of Case II as a method of fire, as the telescope of the layer for line is not capable of vertical movement other than that given to the cross connected sight by the layer for elevation. The required effect might, however, be obtained by the employment of a subsidiary sight having the optical arrangements of the dial sight but mounted so that the central pillar was capable of revolution in a vertical plane; the cross wires being replaced by a small circular graticule.

It is of course essential that any method adopted should be of a type that enables a rapid change from Case II to Case I to be effected without delay or confusion.

[1] Case II was employed on a few occasions in France with earlier equipments but no records bearing on the subject appear to be available.

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CONCLUSION.

The question as to the employment of Case II under the various conditions discussed above is an important one. Its advantages as a method of fire are manifest; its disadvantages—other than the mechanical difficulties previously referred to—are small and chiefly consist of the fact that a choice has to be made between two methods of fire when engaging a target. But if the height fuze indicators are marked in the way that has been suggested, that objection should disappear.

In all new schemes of fire control it is most desirable to carry out practical trials in the field, but in A.A. shooting it is extremely difficult to make any sort of comparative trial for effect. Also appearances are most deceptive; for example, all the rounds of Case I shown in Diagram No. 1 would be considered entirely satisfactory although only one round is likely to cause a hit. The Case II series would probably give the impression of being rather poor and scattered, although in reality it is likely to be far more effective.

A practical trial would however be most useful in showing up defects or inconvenience in drill. The reports of a distant observer at right angles to the line of fire would be helpful, but if the comparative trial had been carried out with the reduced practice charge the variation in heights of bursts that occur with a Case I series when an advancing target is being attacked would not be clearly demonstrated.

A more convincing demonstration of the relative merits of the two systems would be afforded by plotting out the examples given in Diagrams Nos. 1 and 2, also other examples, to full scale on the ground. A demonstration of this kind is more likely to be of assistance in assigning values to different types of A.A. fire than small scale drawings as in the latter almost any kind of system can be made to look reasonably effective.

The main question intended to be raised in this paper is not whether the present equipment can be conveniently adapted for Case II or whether one particular type of Q.E. plate is superior to another so much as the great advantages that may be gained by the employment of any sound system of A.A. fire control which makes all possible use of trajectories where their shapes are of such a character as to hold out strong hopes of increased effect.

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LESSONS OF THE GREAT WAR.

The barrage versus concentration on selected targets.

By Captain O. G. Body, d.s.o., R.A.

F.S.R. Vol II, section 72. "Artillery in the encounter attack," para. 2.

> "Artillery support can be afforded by means of barrage fire or by concentrations on selected targets or by a combination of both methods."

F.S.R., Vol. II. "Artillery in the deliberate attack," para 4.

> "For the support of the attack barrage fire will be the normal method of fire employed by light artillery and by some of the heavier natures."

THE idea that the barrage can and will be applied as the normal method of artillery support in all the varying natures of attack from encounter to deliberate battle now seems to be definitely established. It must be regarded as the normal method of artillery support. The question which has previously exercised the mind of the gunner is "can this be done?" "Is it practicable from an artillery point of view?" It certainly can be done. Its practicability is also merely a matter of training. These however are not the questions with which we should concern ourselves. Our questions should rather be "Is this the best form of artillery support?" "Can it possibly be reconciled to modern infantry tactics?" The gunner requires to make a very careful study of Infantry Training Vol. II, before he can answer those questions. The infantry still remain the directing arm in battle. The one aim and object of the artillery is still to permit the infantry to close. Changes in infantry tactics are bound to act and react upon other arms. Artillery tactics require constant revision in order that they shall keep abreast of the corresponding infantry tactics of the day.

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The intense creeping barrage made its appearance when trench warfare was at its height and attacking infantry were assembled within one or two hundred yards of the enemy foremost trenches. The barrage must be associated with "lines of attacking infantry" and "infantry waves" and such like formations. These infantry tactics are now obsolete. New infantry methods have been substituted, and these new methods have had a corresponding influence on the artillery tactics of the day. The support of infantry in the attack of modern defensive positions, arranged as they are in great depth, present many difficulties to the artillery, which have not yet been fully realised. Battles will no longer move in straight lines—and the barrage does, that is the gunner's difficulty. The modern battlefield will resemble a chess board some squares of which are held by the enemy, some by our own troops. The whole board is open for play. We cannot hope to check or mate on any predetermined square.

The attacks of 1916 saw the artillery definitely committed to the creeping barrage as the normal method of support, as opposed to the doctrine of concentrations on selected targets. The Somme failed to achieve any strategical success or even tactical successes commensurate with the losses involved. The German attacks of March, 1918, however, saw a new master mind at work and the problem near solution. It is to the lessons of those attacks to which we must turn in order to make sound deductions as to the correct employment of infantry and artillery in co-operation.

The British and French attacks of August and September, 1918, do not present a complete parallel. By this time a new element had been introduced in the tank; and we eventually broke the German line by attacks of infantry, accompanied by tanks, and supported by artillery. The Germans on the other hand achieved their great break through with infantry and artillery only. There are, however many interesting examples, some of which will be quoted later, when, during our autumn attacks of 1918, a departure from normal artillery methods was made with complete success.

In consideration of the success which the combined infantry and artillery tactics of the Germans attained during the spring attacks of 1918, it must be borne in mind that the Germans had followed an artillery armament policy entirely different from our

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own. While we had developed the flat trajectory field gun and the shrapnel shell, the Germans on the other hand had gone all out for the field howitzer and high explosive. Freytag von Loringhoven in his "Deductions from the World War" written in 1917, makes it clear that this was the result of deliberate policy in no way influenced by the difficulty of manufacture of the timed fuze, as many have led us to suppose. He declares that "It was soon apparent that a large increase of light field howitzers was required." A necessity which was not observed in our army. It is unnecessary to comment further on the relation between their armament policy and the artillery tactics they were eventually to follow and perfect.

On pages 574 and 575, "My War Memories," Ludendorff set down very clearly the new features he was to introduce. They may be summed up as follows :—

Firstly. The short intense artillery bombardment. The concentration of artillery fire against strong points and localities known to be held by the enemy, as opposed to the treatment of whole areas with shell fire by rolling barrages whether they were held or not.

Secondly. The use of infantry weapons, and the avoidance of complete dependence on the barrage. The infantry battalion as a self reliant unit, more capable than ever before of getting forward "under its own steam." Heavy machine guns, mortars, and infantry guns following the attack closely.

Quoting from Ludendorff's book (page 575) :—

"Of course massed artillery prepared the attack. It could however only do so in a general way, and left untouched so many of the enemy strong points which had to be dealt with later at short range."

Opposition on the battlefield can be definitely divided into two classes.

1. Major opposition that can be foreseen. Such as defended localities and strong points.
2. Minor opposition that cannot be foreseen. Such as small M.G. nests.

1 above can be most economically dealt with by timed concentrations. 2 can only be dealt with effectively by artillery by means of the intense barrage.

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In dealing with these types of opposition the German view differed from our own considerably. Our own view was that both types of opposition should be a gunner responsibility. The German view was that the artillery could only prepare the attack in a general way, and that machine guns, mortars and infantry guns following the attacking infantry at close ranges should be responsible for dealing with the class 2 opposition above. In other words, that the artillery should concern themselves with major tactics only, and could not concern themselves with the smaller hostile groups. These were to be an infantry responsibility, and the infantry battalion was to be given the means of dealing with them.

It must be remembered that Ludendorff's units were only hastily trained to act on these principles. He complains bitterly that his new doctrine had not had time to permeate down to platoon and company commanders. If these principles were definitely adopted and embodied in our training and organisation we could expect still better results. Their adoption would however entail an entire reorganisation of our infantry battalions; and also the inclusion of additional supporting weapons within the battalion, an innovation to which the infantry would not readily agree. The French include a 37$^{m/m}$ gun and the mortar as infantry weapons in their "Compagnie hors rang." The German manual "Führung und Gefecht der verbundenen Waffen" makes much of the importance of the infantry gun. Certainly the increased dependence of the infantry on other arms is an evil which must be fought at all costs. The more infantry are self contained and independent of other arms the better.

There can be no doubt that infantry should be capable, to a greater degree than at present, of progressing "under their own steam." They must have sufficient supporting weapons in their own hands and under their own command to give them a reasonable chance of getting forward in spite of the occasional hostile groups and machine guns which the artillery have left untouched. A forward échelon of supporting fire must be organised in front of the guns which can follow the infantry closely and deal with unforeseen opposition. Those are the principles enunciated by Ludendorff on pages 574 and 575, "My War Memories." They require to be very closely studied by the gunners on account of the

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success which they achieved. That school of artillery thought which had up to then rigidly adhered to their belief in the fixed charge, the flat trajectory, the shrapnel shell and the creeping barrage, had received its first definite challenge from those who advocated the variable charge, the H.E. shell, and the concentration on selected targets. The latter school of thought had the greatest success of the war with which to back their arguments.

A new feature of artillery fire in the attack is to create the tactical flank. The introduction of smoke has again increased the importance of this principle. The application of artillery fire with this end in view has great possibilities which have not yet been fully appreciated or exploited. It brings the artillery back once again to bombardment and timed concentrations. In principle it permits us to break away from the tactical frontal attack to which the barrage has so long condemned us. General Montgomery's book "The Fourth Army," contains the following interesting example:—"The task of the 18th Division on the left was to connect up the attack of the 47th Division on Rancourt with that of the 38th Division on Morval by the capture of Sailly Saillisel—Combles valley across which the enemy held the line Priez Farm—Fregicourt—Haie Wood, all of which had been strengthened considerably during the last few days."

"In order to avoid making a frontal attack against the enemy's position in the valley, Maj.-Genl. Lee decided to attack only the southern portion of the position opposite Priez Farm. His plan was to push straight through St. Pierre Vaast wood on this part of the front with *one battalion* and to mask the remainder of the front with artillery, trench mortars, and smoke. The leading battalion was to be followed by two others which would in turn change direction, attack northwards and take the enemy's position in the rear. The attack was a complete success. The 8th East Surreys in the van after capturing Priez Farm, where fighting was very bitter, achieved their final objective with comparatively little loss."

The barrage does not permit any such variety of infantry tactics and enforces a rigidity which is most undesirable even in the deliberate attack. The infantry are tied down to definite objectives which must be predetermined beforehand on the map. The leap-frogging must take place at definite stages in the advance regardless

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of the progress made. Troops may well reach an objective just as they have gained a decided moral advantage over the enemy and that moral advantage be denied to them owing to the barrage halting to allow a pre-arranged leapfrog to take place. In the two instances given below, the Australian attacks on Mont St. Quentin and the attack of the III Corps on the Forêt de Mormal, the effect of substituting the timed concentration for the barrage shows the greater liberty of action in which the change permits the infantry to indulge.

On page 245, referring to the fighting of the III Corps on November 3rd, 1918, General Montgomery states:—

"The instructions for the artillery support of the III Corps attack were drawn up after a careful study of air photographs and the barrage was modified to suit the peculiar conditions. Owing to the wooded nature of the country (The Forêt de Mormal), many areas were unsuitable for the 18 pr. barrage. Moreover, undergrowth impeded the advance of the infantry and rendered turning movements necessary. Certain areas or blocks were therefore kept under fire for definite periods which allowed time for the infantry to work round them. The fire was then lifted onto other areas which were treated in the same manner. The fire was combined with a thin creeping barrage, the advance of which was regulated on the usual principles. This system of block barrages continued as far as the first objective beyond which the infantry was to be supported by brigades of field artillery and 6 in. hows.

Here we have the definite principle of the bombardment of certain areas for definite periods. These areas became pivots of manœuvre for the attacking infantry; the fire being lifted off them when the infantry had worked to the flanks and rear. Thus we see the infantry were given far greater liberty of manœuvre, than in the case of an ordinary barrage. The influence of these artillery methods on the infantry tactics employed on this occasion is interesting.

The 25th and 18th divisional commanders both commenced their attacks with two brigades in the first line and leapfrogged with their third brigades on reaching their first objective. The 50th divisional commander, however, ordered an advance on a two brigade front and decided to pass his third brigade through

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the leading brigades "as soon as it was considered that the attack required fresh impetus." With the 25th and 18th Divisions the attacking infantry were definitely committed to their objectives. The 50th divisional commander however realised the greater liberty of action which the nature of the artillery support afforded to him, and was influenced in his orders. The further history of this attack is interesting and bears on the point made above. The two leading brigades of the 50th Division were held up very early on and made little progress, and it was decided to put in the third brigade. While this brigade was moving up, the two leading brigades again went forward and now made very good progress. The third brigade did not go in until very much later in the day. The nature of the artillery support alone permitted the infantry to adopt such tactics.

The attacks of the Australian Corps on Mont. St. Quentin from August 30th to September 1st, 1918, are also good examples from the same book. They demonstrate that in deliberate battle the means of artillery support is by no means restricted to that of the barrage.

Page 98, "The Fourth Army." The seizure of the bridgehead south-east of Clery-sur-Somme prior to the battle of Mont St. Quentin. 30th August, 1918, 5th Brigade, 2nd Australian Division. "At 10.30 a.m. the approach march to Clery-sur-Somme began, and the column moved off with the 20th Battalion leading, followed by the 17th and 18th. Crossing the river at Feuilleres where the bridge had been repaired, the column proceeded eastwards along the north bank of the river. As it was difficult to ascertain the exact situation in the vicinity of Clery-sur-Somme, the troops of the 5th Brigade took the precaution of making as much use of the existing trenches as possible. This precaution was well repaid as the enemy was found to be holding the trench system north and east of the village. By 9 p.m. these trenches had been cleared of Germans, and the 17th Battalion following behind the 20th debouched from Clery-sur-Somme. The 18th remained in the village in reserve. *In the short time that was available it had not been possible to arrange a creeping barrage, but artillery fire was maintained on areas and objectives selected by infantry commanders according*

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to requirements. The advance progressed satisfactorily and by 10.30 p.m. a line had been established in the old trench system from the river near the western end of Limberlost Wood to a point south of Berlin Wood, a suitable position from which the attack could be launched the next morning. During the fight 120 prisoners and 7 M.G's were taken."

The following is an extract concerning the next day's fighting. The main attack on Mont. St. Quentin, August 31st. "The attack on Mont St. Quentin by the 5th Brigade *with only hastily arranged artillery support and without a creeping barrage* ranks as one of the most notable examples of pluck and *enterprise* during the war." The attack continued September 1st. *There had been no time to arrange for a creeping barrage to cover the advance of the infantry, and heavy concentrations of artillery fire were therefore placed on known and suspected points of enemy resistance,* this fire being lifted onto fresh points at fixed times as our advance progressed."

These attacks represent some of the most intense and bitter fighting of the whole war. Not only was there no barrage, but apparently there was no need. Enterprise and initiative were the distinguishing features of the Australian Corps infantry tactics, which a creeping barrage would not have permitted them to exercise. It is interesting to note also that the commander of the Australian 2nd Division—General Rosenthal—was a gunner—as also was his G.S.O. I. He had no hesitation in committing his infantry to bitter trench to trench fighting without the aid of a barrage.

There is another aspect also which we have to consider. Attacks in modern war will be carried out by three arms in close combination; infantry, tanks and artillery. It is now the accepted doctrine that the tanks will precede the infantry and arrive in the position in advance of the infantry. In these circumstances a creeping barrage can afford little or no protection to advancing infantry. We must avoid the error of dribbling troops into action, and when seeking decision we must attempt, at whatever cost to develop the maximum pressure of each arm as quickly as possible. We must break away from the idea of deliberately capturing successive objectives, and must smother the enemy position as quickly as possible with every means at our disposal as soon as the

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intention to attack has been disclosed. The only artillery tactics which can be adapted to such a doctrine is by concentrations on selected targets, infantry and tanks alike using the areas under artillery fire as pivots of manœuvre. Tanks cannot pass *through* barrage lines, but they may well be able to pass *between* bombarded localities. Tanks are an opportunity weapon, to hem them in under a barrage will seriously impair their initiative, and rob them of their chief fighting characteristics.

At the present time the infantry are preaching a doctrine of opportunist tactics. The artillery on the other hand are tending towards ponderous and heavy methods[1] which predetermine the course of action hours beforehand. These two doctrines are entirely opposed to one another. The above has been written to show that the influence of the barrage has a tendency to impair the initiative of the infantry, and that infantry support even in a deliberate battle by the method of concentrations on selected targets requires far more study than is devoted to it at the present time. With enterprising and well trained infantry it is the normal method of artillery support, under all conditions of war.

[1] In the French manœuvres of 1924, it was interesting to note that in the final attack which concluded the manœuvres the artillery were given the simple order of concentrating their fire on "Les pointes les plus intéressantes."

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THE MECHANICALISATION OF TERRITORIAL FIELD ARTILLERY.

By Major R. A. E. Voysey, R.A. (T.A.).

WHEN the training year of 1925 came to an end, probably no subject was so much and so heatedly debated by territorial field gunners as the question of horse v. tractor for draught purposes, and an attempt to set out the points urged on both sides may be welcome. In considering the problem it must be remembered that the territorial army suffers from certain disabilities peculiar to itself and that, in consequence, the considerations for and against mechanical draught are not necessarily the same as in the case of the regular army. When dealing with partially trained troops the primary considerations are, first, that they should be trained solely with the equipment they will use in war and, secondly, that the equipment should be devised as far as possible with a view to requiring the minimum of training.

A report has recently (October 1925) been circulated on an experiment with the Fordson Tractor, carried out at Okehampton in the early summer. Certain mechanical alterations were made for the purpose, with which it is not necessary to deal in this paper; they were all of a temporary nature and definitely experimental and their consideration is a matter for technical experts. The battery concerned and the senior officers who watched the experiment all seem to be thoroughly satisfied with the results, from all points of view except that of the adaptation of the equipment, in which there appears to be considerable room for further experiment. The principal factors urged on behalf of this form of draught are:—

(1) Equal mobility.
(2) Economy in personnel.
(3) Economy in time.
(4) Economy in money.

Let us deal with these in turn and then consider certain other aspects of the problem which are not covered by the report.

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(1) *Equal mobility.* The battery commander says "Generally speaking they (i.e. the tractors) will pull an 18 pr. wherever it could be taken by a six-horse team." No doubt this is true in an open country, but one is inclined to doubt whether it will prove to be the case in an enclosed one. Every gunner will remember countless occasions when a team has successfully negotiated a ditch or bank which could hardly have failed to stop any trackless motor vehicle; most cultivated countries abound in small and relatively fragile culverts at the gateways between fields—these are meant for horse traffic and, once across, the team can be trusted to get the gun over even though a wheel does break through; would such places stand the strain imposed by a heavy pair of driving wheels?

Again it is not unreasonable to assert that when it comes to manœuvring over difficult country in the dark, and in any future war which will require the mobilisation of the territorial army the bulk of movement will have to take place at night, it will be long odds on the horsed battery. So long as movement is confined to roads, permanent or temporary, there can equally be no question but that the tractor is the winner by a very comfortable margin. Its pace can be accommodated without distress to that of a mixed column, whereas nothing wears out horseflesh more quickly than continual checks. In addition, there are none of the difficulties in making opportunities for watering and feeding that are experienced by a horsed battery in similar circumstances. No information was obtained as to the radius of action of this type of tractor without refilling.

(2) *Economy in personnel.* At first sight this plea might seem to be correct as there would be an obvious saving of three drivers a subsection and a corresponding reduction in the number of farriers. Against this extra horseholders would be required and, probably, at least four fitters in addition to the two now borne on establishment. The present establishment is so small that a reduction would be a very doubtful advantage indeed. The main force of this saving in personnel appears to be that there would be a greater margin within the existing establishment and, in consequence, less chance of the battery being crippled in the annual camp through the inability or unwillingness of employers to spare

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their men for the whole 15 days. However carefully dates are considered, it is not always possible to fix the annual training at a time which suits local industries, and it is very often the best men in the battery who cannot get leave for the full period.

(3) *Economy in time*. This goes to the root of the whole matter and of itself may well be considered sufficient warrant for a change; also, it is the only one of the four points upon which there is no room for a difference of opinion. First, as regards training outside the 15 days' camp. The amount of time necessary to teach a recruit driver the rudiments of riding, driving and the countless important details comprised in the art of horsemastership is out of all proportion to the time and opportunities available. Even in the most favourable circumstances it will always be exceptional to find such a driver who is fit to take his place in a team on arrival at his first camp. The difficulty is increased by the fact that there is now only one centre driver in the subsection. On the other hand it should be possible at every station to hire a certain number of these tractors (even if they cannot be adapted) and to ensure that drivers reach camp not only proficient in the handling of the tractors, but trained to a very fair standard of manœuvre. The facilities for training would be still further increased if tractors were bought by the Territorial Associations In many cases there would be no difficulty in enlisting men accustomed to handling the tractors in civil life.

Secondly, from the point of view of the annual training. However many draught parades have been held before camp, there will always be a certain percentage of drivers who have been unable or too slack to attend, and two or three days at least have to be spent on driving drill pure and simple before the battery can be taken on a drill order to any advantage. If the horses are strange to the work or if the teaming of those which have already been through a camp or two has been unlucky, this time has to be increased. It is not unusual for a battery to shoot during this period, with the result that it sometimes has to come into action short of a vehicle or two, with unfortunate consequences to the moral of all concerned.

Under the present system, it is very difficult to train junior officers and N.C.O's (even if they are available at stable hour—

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frequently they are on the miniature range or under some other form of instruction) in stable management and, as a result, the time spent in stables is not only largely wasted as regards the welfare of the horses, but there is a very grave danger of slack and bad habits being acquired which would take a long time to eradicate on mobilisation, when the condition of the horses would be of vital importance.

Certainly, if mechanical traction is to be a success, all officers and N.C.O's will have to reach a certain standard of mechanical knowledge to enable them to look after the equipment for which they will be responsible. But in these days most officers, and many N.C.O's, know a fair amount about internal combustion engines and, in any case, the time required to attain it will be infinitesimal compared with that necessary to make them into even passable horsemasters. In other words, freed from the necessity of learning riding and horsemastership, they would be able to devote their whole energy to becoming good gunners and, another important point, practically the whole of their preliminary training could be carried out in the drill hall or a neighbouring garage. Further, being actually on the gun-tractor and having only two drivers to look after, the Nos. 1 would find that they had better control of their subsections and the standard of manœuvre would be raised.

(4) *Economy in money.* Ten tractors and one 1-ton lorry were hired (the lorry for 21 days) at a cost of roughly £340. The vehicles were delivered in camp, so that a proportion of the cost must be set down to transport charges and perhaps a further sum allowed for the wages of the contractor's men who looked after the tractors and trained the drivers. Against this possible saving must be set the fact that the makers were out to get an advertisement and may have made a very substantial decrease in their normal charges for the purpose of obtaining it. An additional sum of £265 was spent on the technical alterations, which remained the property of the Association. The estimated cost of using horses, including rail charges and hire of transport for advance and rear parties, was £720. This sum, according to the detailed figures given in the report, was worked out on a basis of 60 horses, as against the, say, 45 required for the teams and spares; it should therefore be reduced to about £516. Although the cost of using

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tractors (£605) would therefore seem to have exceeded the cost of horses (£516) by £90, the excess was principally due to non-recurrent expenditure. Fuel and forage are included in the respective figures.

The initial cost of a Fordson tractor is small and it is probable that a very substantial saving on the hire cost could be effected by the purchase of tractors out of the annual horse-hire grants. The question of hiring out such tractors for use on road work only might also prove worth considering. Once the purchase money had been paid, the cost of training at home stations would be reduced. Even if it were not, better value would be obtained for the expenditure, since more actual drill could be done in any given number of hire-hours. Where civilian horses have to be used, it is quite useless to attempt a full draught parade in a half-day; nearly all the time is taken up with teaming and fitting harness.

To turn to tactical considerations, which are barely touched upon in the report. Now that concealment from the air has become of such vital importance, it seems that tractor draught would increase the value of territorial batteries, which have little or no opportunity of practising it. Not only is the tractor smaller than a team of horses, but it has the cardinal virtue of keeping still in the wagon line, and need leave it less than horses. However successfully horses may be placed under cover, they must leave it to be watered and there is no disguising their tracks and watering places.

Horses get tired but tractors, if properly looked after, do not; nor do they need constant attention whilst unemployed, and their drivers can therefore, if necessary, be used for other duties once their vehicles have been overhauled at the end of the march. Supplies of fuel are much less bulky than forage, an important matter in the case of mobile warfare.

On the other hand there are points on which the tractor seems to fail badly:—

(a) It is noisy, but apparently not more so than the present dragon, and there appear to be difficulties in designing a really efficient silencer.

(b) It is more than questionable whether its mobility, under active service conditions, is sufficient to enable a battery

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with this form of draught to carry out its task. There can be little doubt but that it is inferior to a 6-horse team directly it leaves the road. Possibly one light caterpillar a battery would solve the difficulty.

(c) In the event of a return to conditions such as those on the Somme or in the Ypres Salient, the Fordson would prove absolutely useless and special arrangements would have to be made, not only for the actual movement of batteries into and out of action, but also for ammunition supply.

(d) Certain difficulties would arise from having both horses and motor vehicles in the same unit.

(e) All the eggs are in one basket. There can be no comparison between the respective vulnerability of the two forms of draught. A splinter which would only kill one horse might very easily disable a tractor.

It is difficult to see how any form of commercial motor can ever replace the horse in the battery staff. The horse is less conspicuous and undoubtedly more mobile when single. Further there is less chance of losing a whole party from a minor casualty if they are mounted. A trivial mechanical breakdown might very well throw out a signal group, but it is hardly likely that all their horses would give out at the same time.

CONCLUSION.

However great one's attachment to the horse, one is reluctantly forced to conclude that, as regards the territorial field artillery, the advocates of mechanical draught have more than made out their case. Clearly the choice of a tractor is limited by financial reasons to existing commercial tractors and of these the Fordson is the only one worthy of consideration. Other agricultural tractors are on the market, but their cost is greater and the numbers available in an emergency are negligible.

With all respect, one would suggest that a point has been reached at which further experiments should not be carried out by units of the territorial army. The time available for training is so short that they should not be asked, or even allowed, to spend even a portion of it in drilling with experimental equipments. Such equipments can be tested more thoroughly by trained per-

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sonnel under conditions which approximate more closely to those of war than are met with at a practice camp. There can be very little doubt that batteries which adopt tractor draught will be able to reach a higher standard of efficiency than they would attain if they remained horse-drawn. On the other hand the thought of a mechanically trained battery mobilising with horses is awful to contemplate.

Is not the true solution of the problem to train all batteries with horses until experiments have shown whether the technical difficulties experienced with the tractors can be remedied? If they can and it is considered that this type of tractor is tactically possible, at any rate as a makeshift until a specially designed tractor can be provided, then batteries should be mechanicalised as rapidly as possible up to the point at which the number of tractors available on mobilisation would be exhausted, further batteries being dealt with as the supply increased.

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APPENDIX.

SUGGESTED REDISTRIBUTION WITHIN THE LIMIT OF THE EXISTING ESTABLISHMENT.

		Officers	W.O.'s, etc.	Sergeants	Bombardiers	Gunners	Signallers	Drivers (H.)	Drivers (M.T.)	Trumpeters	Artificers	Artificers (M.T.)	Farrier	Horses	Tractors	Lorry
Headquarters		3*a*	2	—	3*b*	11*c*	6	11*d*	1	2	—	—	1	31*g*	—	1
Right X	A	1	—	1	2	9*e*	—	—	4*f*	—	1	1	—	—	3*h*	—
	B	—	—	1	1	8	—	—	3*f*	—	—	1	—	—	2	—
Left X		1	—	2	3	17	—	—	7	—	1	2	—	—	5*h*	—
Total		5	2	4	9	45	6	11	15	2	2	4	1	31	10	1

a B.C., Captain, G.P.O.
b Signallers.
c B.C.A., G.P.O.A., 3 batmen, 2 cooks, 2 sanitary orderlies, 2 spare.
d 9 horseholders (including 2 for section commanders), 2 spare.
e Including batman for section commander.
f 1 per tractor and 1 spare.
g 5 officers, B.S.M., B.Q.M.S., B.C.A., G.P.O.A., 9 signallers, 2 trumpeters, 9 horseholders, farrier, 1 spare. Owing to the increased number of dismounted men with the firing battery, it appears necessary to mount the No. 4 signallers; No's 1 can ride on tractors.
h 1 spare per section.

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THE EVOLUTION OF ARTILLERY IN THE GREAT WAR.

V.—EVOLUTION OF ARTILLERY TACTICS (1).

By Major (Bt. Lt.-Col.) A. F. Brooke, d.s.o., *p.s.c.*, R.A.

Introductory.

THE evolution of artillery tactics during the great war lends itself to the sub-division of the subject in the following three periods:—

(a) The period of growth.
(b) The period of destruction.
(c) The period of neutralisation.

The first of the above periods was necessary as a preliminary measure to either of the subsequent ones, and comprised a rapid growth of artillery material, organisation and tactical ideas. In the second period we find the artillery power which had thus been created directed mainly by a policy of destruction, whilst in the final period increased experience in the handling of artillery power pointed to the advantages of neutralisation as opposed to those of destruction.

I. PERIOD OF GROWTH (1914-15).

1. Phase of mobile operations.

The initial operations in 1914 are of interest as they afford an opportunity of examining our pre-war tactics tested in the field of battle.

(a) *French Eastern offensive.*

The French in their eastern offensive battles soon found themselves outranged by the German artillery. The famous 75 when opposed to the heavier German artillery was unable to compensate for lack of range through mobility. Whilst the weak French heavy artillery, marching in rear of infantry columns, was not in a position to intervene in adequate time. As a result French field batteries

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were frequently subjected to hostile fire whilst still in column of route, and were heavily engaged without being able to retaliate. The above situation reacted disastrously on the infantry. Trained to attack without previous artillery preparation, but relying on artillery support during the attack, battalions found themselves subjected to devastating fire from rifles and machine guns which remained unengaged owing to the difficulties the field artillery were encountering. As a result, the French Higher Command found it necessary to recommend that the rate of advance of the infantry should be moderated, attacks prepared by artillery, and assaults carried out by more diluted formations.

(b) *Retreat from Belgium.*

Turning to our own Expeditionary Force, we find it engaged in a series of defensive battles which seriously tested the pre-war tactical training. One of the most striking features of this period lies in the method by which the artillery endeavoured to render to the infantry that close support which had been the main object of its training. The instructions appear to have been interpreted to imply the close support of the "gun" as opposed to that of the "shell." At the battle of Le Cateau we see complete brigades of artillery disposed within 500 yds. of the infantry they were covering. There is no doubt that the gallant manner in which these guns were fought provided a distinct moral support to the hard-pressed infantry. Such assistance was however bought at a high price, and in many cases the fire power available was reduced to a minimum at the critical moment of the attack. The necessity for depth in the distribution of artillery in the defence is well exemplified in these early engagements, and from this period onwards received our attention.

The impossibility of maintaining guns in action in open positions against a strong force of modern artillery had already been proved during the Russo-Japanese War. It required, however, actual experience to drive these lessons home and to prove to us that such a procedure must necessarily entail the neutralisation of our batteries at the critical moment, and destruction of equipment calculated to seriously affect the available fire power through subsequent days.

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(c) *The Advance to the Aisne.*

The rapidity of the German advance had momentarily deprived them of the assistance of their heavy artillery and allowed our field batteries and the French 75 to offer less interrupted support to the infantry. On reaching the Aisne, however, we find the German heavy artillery again rejoining the field forces, and as a result our field artillery is once more held at arm's length. The costliness of frontal attacks had by now been amply proved and as a result the race for the sea commenced.

(d) *The First battle of Ypres.*

The ever-increasing dependence of mobility on fire power had been evident from the very first engagements in the war. The first battle of Ypres provided the culminating example during this early period. Although the Germans attacked with superior numbers, supported by heavy artillery withdrawn from Antwerp, and under the eye of the Kaiser, yet the repeated attacks were brought to a standstill by the fire power of the defence. Modern small arms efficiently handled and assisted by our field batteries and French batteries of 75, richly provisioned with ammunition at the expense of the rest of the front, had robbed the German attack of that mobility with which it hoped to gain the Channel ports. With this battle ended the mobile period of operations, and trench warfare gradually set in. We should examine carefully the reasons of this change. Elaborate systems of trench defences had not yet been created, impenetrable barbed wire entanglements did not exist, the available reserve in trained men had been seriously depleted on both sides, but not sufficiently so to preclude the possibility of a further effort. Is not the real cause to be sought in the superiority which "fire power" had established over "movement"? We had come to realise that the forward movement of the attack could only be maintained through the assistance of fire power far in excess of our pre-war conceptions. The devastating effect of automatic and small arm fire of the defence, was such as to rapidly rob the attack of its forward momentum. This small arm fire could only be neutralised by artillery fire on a scale necessitating a distinct increase in the proportion of guns and above all ammunition. In view of subsequent experience gained, it is interesting to

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conjecture what the results might have been had either side been provided with lavish supplies of ammunition during the last two months of 1914.

2. 1914-15. WINTER TRENCH WARFARE.

As the winter set in experience taught us that modern war necessitated an artillery ammunition expenditure beyond any of our wildest conceptions, to meet these requirements we were faced with bankruptcy in our ammunition reserves. The French 75's had already been reduced to only 500 rounds per gun after the battle of the Marne, a figure which had been further reduced by the advance to the Aisne and the first battle of Ypres, whilst the daily output only amounted to some three or four rounds per gun per day! The situation was so critical that the French were forced to arm some 100 batteries with an obsolete equipment, the 90 de Bange, for which reserves of ammunition existed. The situation in the British Expeditionary Force was no better. Batteries were reduced to a daily ration of some five to ten rounds per day, whilst every possible effort was made to accumulate reserves.

Under such conditions evolution in artillery tactics could make but small headway. The germs of a few new conceptions are, however, noticeable. For instance the night lines allotted to each gun, were the first steps towards the protective S.O.S. barrage which we find employed at a later date, and which finally resulted in distinct errors in the tactical handling of artillery in the defence. We also find attempts to engage hostile transport, and centres of activity during the hours of darkness, which represent the initial steps towards the scientific programme of night harassing fire which we shall find at a later date. Our attention was naturally drawn to the necessity of devising some method of engaging the hostile artillery, these attempts were still, however, so elementary that they can hardly be considered as the actual germs of the required organisation. The difficulties of extended observation from the ground naturally turned our attention to the possibilities afforded through the use of aircraft, and the co-operation between aircraft and artillery commenced to make that rapid progress which remained one of the features of the war.

Although lack of reserves of men and material precluded any possibility of offensive operations on the British front a series of

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minor operations were undertaken by the French forces, such as the attacks at Perthes (Jan.), Soissons (Jan.), Vanquois (March), les Eparges (April), and Artois (May). During these operations the French gained considerable experience as to the density of artillery fire required in modern attack. The fact is worthy of notice that in these attacks the French were forced to adopt lengthy preliminary bombardments to compensate for the limited numbers of their heavier equipments. At a later date when we found ourselves in a position to stage attacks on our own front, our conception as to the methods to be adopted were distinctly affected by the experiences gained by the French in their earlier attack.

The period under consideration cannot be passed without reference to the critical situation which occurred as regards the 75 equipment. As long as these guns had employed the carefully manufactured pre-war ammunition no trouble had occurred. Reduced to new stocks of hastily turned out ammunition serious trouble developed through prematures. A long series of accidents occurred of such a serious nature that by the end of May out of the 3840 75 guns with which the French started the war, only 2400 remained! In one morning a "Groupe" had burst 10 guns out of its total of 12! Such accidents not only caused a serious loss of equipment and valuable personnel, but were calculated to shake the confidence of the French field artillery in its equipment. The incident is of importance as it shows clearly that faulty pre-war conceptions, such as our estimates of ammunition expenditure, may lead to further faults through hasty attempts to repair the original error. Our rapid survey of the winter of 1914-15 would remain incomplete without registering the first outcrops of wire entanglements, which were to spread like weeds and ultimately result in those dense belts of wire some 50 yds. wide, which were used so freely in the protection of the Hindenburg line. Had Napoleon been alive during the last war, he would most certainly have added "wire" as yet a sixth element. The fact must be recognised that "wire" exercised a direct influence on the tactical handling of artillery. During these first few months of trench warfare, we began to realise that unaided infantry attacks launched against wire defences were doomed to failure. It was only natural that artillery as the supporting arm, should be called on to remove

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the obstructions. As a result we find the artillery confronted with an entirely new problem which had not been seriously considered before the war.

3. Spring offensives.

The winter months had rendered possible the accumulation of very limited reserves of men, guns and ammunition. As a result the situation now admitted of minor offensive operations. The advisability of staging any such attacks with the limited resources available, might well be discussed, but would inevitably lead us beyond the scope of the present article. We must consequently limit our outlook by considering only the artillery tactics employed in these offensive operations, taking into consideration the resources available at the time.

(a) *Battle of Neuve Chapelle.*

The battle of Neuve Chapelle is of particular interest since it provides the first example of an attack of penetration carried out by us. The deductions we drew at the time from the result of the attack influenced our subsequent artillery tactics considerably, and are therefore worthy of some detailed examination. Although the front selected for the initial attack did not cover more than some 2000 yds., and only three infantry brigades were employed in the preliminary stage, the operation was intended to assume far larger dimensions, embracing the whole of the First Army on a front exceeding 10 miles. As the front selected for the initial attack was only held by six German companies, and approximately two German divisions held the sector which might ultimately be involved in the attack by the First army, from a purely numerical point of view the chance of success might be considered to have been definitely in our favour.

The artillery destined to support the attack consisted of :—

246 field guns.
36 field howitzers.
38 4·7″ guns.
24 6″ hows.
4 9·2″ hows.
1 15″ how.
5 6″ guns.

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Owing to the converging nature of the attack, the actual frontage requiring direct artillery support was reduced to some 1200 yds. We see, therefore, that the above concentration of artillery allowed approximately one 18 pr. per 6 yds. of front, and one gun of all natures to 4 yds. of front. It should be noted that such a density of guns was only equalled once during the whole of the war, and under very different conditions during the final stages of the battle of Ypres in 1917.

The hostile artillery opposed to the attack only numbered some 24 field and 36 heavy guns. The attack was consequently supported by a concentration of artillery which should in itself have gone a long way towards ensuring success. When we turn to examine the ammunition situation prior to the attack, our conception as to the artillery power available requires re-adjustment. To cover the whole operation the following reserves, supplementary to échelons, were available :—

13 prs.	500	rounds per gun.
18 prs.	410	,, ,, ,,
4·5″ how.	210	,, ,, ,,
60 pr.	450	,, ,, ,,
6″ how.	400	,, ,, ,,
6″ guns	400	,, ,, ,,
9·2″ how.	250	,, ,, ,,
15″ how.	35	,, ,, ,,

We see, therefore, that with the exception of ammunition, the resources available seemed adequate to promise considerable success. It remains to examine the nature of the defences opposed to us. These consisted for the greater part of shallow water-logged trenches. The low-lying nature of the country rendered deep dug-outs impossible, and only a single system of trenches had been constructed. The wire defences consisted of two or three rows of barbed wire "chevaux-de-frise" with an average depth of some 10 yds. Aerial photography had been employed for the first time in the war with the object of providing a series of photographs covering the front of attack, which were reproduced on a 1/5000 map.

Turning now to the actual artillery plan of attack we find in the first place that secrecy was considered of primary importance.

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Although a preliminary bombardment was to precede the attack its duration was only to be 35 minutes. Any necessary registration of guns was to be distributed over a period of two to three weeks whilst the 9·2″ and 15″ hows. were not to be disclosed prior to the attack. As a result of experiments previously carried out it was ascertained that with the existing types of equipment and ammunition, the most satisfactory method of engaging hostile wire defences consisted in employing 13 pr. or 18 pr. guns, firing shrapnel at close ranges. Special batteries were consequently detailed for this task and assigned definite lanes to cut. Some ninety 18 prs. were employed and were carefully registered from positions approximately 1500 yds. from the German wire defences. Batteries detailed for wire cutting were to open fire at a rapid rate for ten minutes during the preliminary bombardment, 50 rounds per gun being allotted.

The preliminary bombardment opened at 7.30 a.m., the attack being launched at 8.5 a.m. The objectives assigned to batteries during the bombardment consisted of wire cutting as previously described, and trench bombardment by the remainder of the 18 pr. batteries. The 4·5″ and 6″ hows, some 60 howitzers in all, engaged the front defences, the 9·2″ hows. the village of Neuve Chapelle, and the 15″ how., 4·7″ and 6″ guns were destined to engage hostile batteries located on the Aubers Ridge. The results of the preliminary bombardment with a few exceptions, may be considered to have been successful. The arrangements for dealing with the hostile wire proved fairly satisfactory, in one case thirty-six 18 prs. firing at a range of approximately 1300 yds. cleared a gap of some 500 yds. Unfortunately the late arrival of two 6″ siege batteries rendered impossible any previous registration for these howitzers. As a result the tasks allotted to them were not adequately dealt with. Owing to the early morning mist and interruption of communication, the heavy howitzers were forced to resort to map shooting, which left much to be desired as the evolution of methods leading to the accuracy of such fire had by then not yet then been developed.

The plan for the artillery support of the attack was simple and comprised two distinct phases. In the first place a lift of fire from the forward defences to the village, and in the second phase a lift to form a belt of fire 400 yds. in depth round the front of the

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captured position, whilst 4·7″ guns swept the approaches to the villages and counter-batteries continued with their original tasks. The initial attack met with success in the centre, but on the northern flank opposition was encountered owing to trenches having been inadequately bombarded by the two 6″ siege batteries previously referred to. On the southern flank attacking troops lost direction owing to the salient formed by the trenches on this portion of the front. It is unnecessary for our purposes to go into any details of the result of the attack which met with limited success. The failure to obtain greater results cannot, however, be ascribed to the tactical handling of the artillery.

We have purposely treated this operation in some detail as it forms a distinct landmark in the evolution of artillery tactics. It would be impossible to appreciate the influence which this action exercised on the future handling of the artillery, without having an outline picture of its employment during the attack. The methods employed and results obtained were carefully examined, and deductions drawn with the object of arriving at the best method of employing artillery under conditions of static warfare. Were the conclusions arrived at correct? In our winter experience of trench warfare our attention had gradually been riveted on the hostile defences and wire entanglements. These were visible and concrete, and always under our observation, whilst the fire power protected by these defences remained latent and unseen except in cases of emergency. As a result the wire entanglements and trench systems were looked on as the real obstacle to our advance, and not the fire power behind them, to which they were entirely subservient. Remove or neutralise the fire power from behind the defences and their very object ceased to exist. Yet we were gradually lead into considering that the destruction of the obstacle should be our primary object.

We employed, in the battle of Neuve Chapelle, a hurricane bombardment of only 35 minutes duration, with limited reserves of ammunition, the destructive results to be hoped for from such a procedure could not be extensive, yet the hostile defence was seriously shaken at the point of attack, and initial objectives secured without any very severe opposition. If we examine the hurricane bombardments made use of by the Germans in their offensives of

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1918 we shall see that the results sought for were those of neutralisation and not of destruction. The object of such bombardments being to paralyze the defence at the critical moment of the attack, and to render it unable to make use of the obstacles which it had erected for its protection. The destruction of the obstacles was distinctly not anticipated except in a few definite places where passages were required to ensure that the effect of the attack should materialise before the recovery of the defence from the effects of paralysis. The intensity of a preliminary bombardment has a distinct bearing on its neutralising effects. In the case of a prolonged bombardment, the defence gradually adjusts itself to the new conditions. The defenders begin to realise that in spite of the heavy storm of shell the casualties are not excessive, systems of command and inter-communication are re-adjusted to meet the new situation, and by the time the attack is launched, the defence may be shaken, but still sufficiently organised to offer opposition.

In the case of a hurricane bombardment the situation is different, a condition of torpor is produced in the defence. Troops subjected to a hurricane of shells are inclined to form an exaggerated idea as to the catastrophy that is befalling them. Casualties are recurring more rapidly than in a protracted bombardment and consequently make a deeper impression on the minds of the defenders, calculated to produce fear and panic. The defensive organisation itself is similarly affected, command posts are blown in and detachments left isolated and uncontrolled, methods of intercommunication are interrupted, and units left without orders; communications and approaches are blocked hampering the movement of supports and reserves, the nervous system of the defence is affected and confusion is created without the possibility of adjusting and acclimatising the defence to the new conditions before the attack is launched.

Surely any success that was achieved at the battle of Neuve Chapelle was mainly due to the paralyzing effect of a 45 minutes' bombardment by a relatively large concentration of guns, and not to its destructive effects on the hostile defences. Yet as we shall see by the methods adopted at subsequent attacks, the lessons appear to have been misread. The failure of the two unregistered 6″ how. batteries was taken to indicate that the attack at this point had not

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succeeded, owing to the undamaged nature of the defences on the front allotted to them, and not to the fact that the defenders of these trenches had equally escaped the effect of the bombardment. We shall find ourselves gradually led into a policy which had as the ideal the complete destruction of all defences irrespective of the fact that such a procedure entailed the sacrifice of all surprise, and the creation of new obstacles to our advance in the shape of shell torn areas.

(b) *Second battle of Ypres.*

The German gas attack at Ypres threw us back on the defensive at a moment when our thoughts were entirely engaged in offensive channels. Owing to the unexpected nature of the attack we were not provided with an accurate test as to the efficiency of our defensive artillery tactics, but the value of the area of battery positions as a distinct line of resistance, in a defensive system, was well demonstrated. We learnt that a determined battery can hold up for some time hostile troops directed against it. The issue of Lewis guns to batteries at a later date added to this power of resistance, and we shall see lessons learnt at Ypres made full use of during the defensive battles of 1918.

(c) *Battle of Festubert.*

The first symptoms of our future destructive policy now become apparent. The preparation for the attack included a 48 hours' bombardment as opposed to the 35 minutes of Neuve Chapelle. The German wire defences had increased. Complaints had occurred in the previous attack as to short shooting and inaccuracy of unobserved fire. New wire cutting methods were consequently adopted, consisting of slow observed fire from 18 prs., whilst trench systems were subjected to a steady observed destructive fire. We had definitely departed from the short and intense hurricane bombardment, with its neutralising properties, in favour of the purely destructive effects of a slow and deliberate bombardment of two days. Although the results of the attack were distinctly less favourable than those of Neuve Chapelle, our failures appear to have been mainly attributed to insufficient destruction.

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(d) *Battle of Givenchy.*

The three minor operations against the crest of the Givenchy Ridge may be classified as failures, since in each case we were subsequently ejected from the objectives we had gained. A point of interest arises in these operations in the tendency to blame the artillery for failing to maintain the infantry on its final objective, thus providing a further stimulus to the doctrines of defensive S.O.S. barrage.

Although the offensive operations which we have examined, viewed through the eyes of future experience, can only be classified as minor enterprises, we were again confronted with an ammunition crisis, and all tactics for the time radically affected by depleted reserves. By 1st June, 1915, the ammunition available had been reduced to the following figures which speak for themselves, when compared with those of war establishments :—

	Rounds per Gun.	
	Available in France.	*War Establishments.*
13 pr.	413	1000
18 pr.	573	1000
15 pr.	444	1000
4·5″ how.	240	800
60 prs.	649	500
4·7″ gun	298	500
6″ how.	73	495

We have already referred to the inadequacy of war establishments, and should therefore fully appreciate the impossibility of carrying out any offensive operations for a protracted period when reserves had been reduced to approximately 50% of establishments !

4. Autumn offensive.

The summer months were necessarily employed in building up new reserves of ammunition, and in awaiting reinforcements of new formations which would render possible attacks on a larger scale.

(a) *Loos.*

By the middle of September we attacked at Loos on a front of 11,200 yds., close on eight times the frontage of the Neuve Chapelle

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attack, whilst the increase in available artillery had not augmented in corresponding proportion. The frontage per field gun was increased to 32 yds., whilst that of guns of all natures had risen to some 23 yds. Namely the density of artillery as compared to the front of attack was reduced to a fifth of that at Neuve Chapelle. This weakness in guns was accepted without much adverse comment owing to the great results expected from gas. Yet a further loss of surprise was entailed through the decrease in density of artillery. The same degree of destruction was still looked for, and could only be achieved by prolonging the period of preparation. We thus find the preliminary bombardment increased to 4 days, whilst its daily intensity was naturally greatly reduced by the paucity in guns available.

In our attempts to achieve destruction we had at Festubert thrown tactical surprise to the wind, at Loos we were also prepared to sacrifice strategical surprise for the same object. The spring offensives had proved that the organisation of the higher control of artillery required re-adjusting. Existing systems did not admit of sufficient centralisation during the preparation and preliminary stages of the attack. Improvisation heralded the introduction of the majority of the evolutionary changes during the last war. Both in the I and IV Corps improvised Corps Artillery H.Q's. were established with the object of co-ordinating the plans of all divisional artilleries, placed directly under their orders throughout the preliminary bombardment and up to the hour of assault. The heavy artillery, however, still retained, for the last time, its pernicious organisation in heavy artillery reserve groups. Such a system, whereby artillery responsible for counter battery and heavy bombardment tasks, remained entirely independent of the corps organisation, could only result in lack of liaison with attacking formations.

Counter-battery tactics suffered at this period from too many parents to make any rapid progress. Divisional artilleries were doing their best to engage hostile batteries with the limited resources at their disposal. Heavy artillery reserve groups duplicated the counter-battery intelligence work of the divisional artilleries with ample resources, but less knowledge of the tactical situation. Field survey units were making noble attempts to provide indispensable

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counter-battery intelligence, but were treated with suspicion by both divisional artilleries and heavy artillery reserve groups. Finally, the Royal Flying Corps, still in its infancy as regards methods of co-operation with artillery, was endeavouring to render assistance but in doubt as to when and where help was required. Failure to arrive at any successful results pointed clearly to the necessity for some central co-ordinating organisation, whereby the various independent efforts could be directed towards the attainment of one and the same result. A distinct step in the tactical handling of artillery may, therefore, be registered at this period, as the necessity for some kind of central counter-battery control had been realised.

In the artillery support of the assault the gradual trend in the evolution of artillery tactics may also be traced. This support consisted of a "lifting barrage" moving from trench to trench, and as the number of hostile trenches had increased since the spring something in the nature of a "creeping barrage" was necessitated. Though we had not yet arrived at the "rolling barrage" of the future, since the fire of the successive lifts was directed on to definite trenches and not by a gradual increase in ranges, a step in the evolution of artillery support in the attack had been made. It is even probable, although definite proof is not available, that at least one division artillery during this attack lifted its fire from trench to trench by a series of rapid lifts of 50 yds.

(b) *French offensive in Champagne and Artois.*

The battle of Loos formed part of the grand offensives decided on at the Inter-Allied Conference of Chantilly of the 7th July, 1915. The French were consequently engaged in serious offensive operations in Champagne and Artois by the 25th of September. On fronts of 35 and 15 kilometres the French attacked with a density of 30 to 32 yds. of front per field gun, and 36 to 40 yds. of front per heavy piece. Three days of preliminary bombardment preceded the attack, and comprised the destruction of wire entanglements, flanking defensive organisations, and hostile battery positions. The attack was supported by lifts of fire from trench system to trench system, and a programme of neutralisation of hostile batteries. Partial successes were scored, mainly against the hostile forward

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system of defence. The enemy warned as to the impending attack by the length of the bombardment, had time to prepare suitable reserves with which to check the advance after the initial successes had been gained. The tactical and strategical results were negligible and had been bought at the cost of countless lives and an expenditure of over one million rounds of 75 ammunition.

As a result of the operations, two important French "Instructions" were issued, that of the 20th November, 1915, and of the 16th January, 1916. In the former the necessity for a counter-battery organisation was definitely realised, whilst the corps was selected as the formation possessing sufficient frontage to admit of the most useful control of counter-battery work. The later "instruction" is of special interest and contains the following extracts, the translation of which conveys the best idea of the French tactical ideas existing at that date :—

(i) Combined offensives must consist of co-ordinated operations carried out simultaneously on extended fronts by a series of successive attacks, each of which must necessarily be limited as to its depth of penetration by the possibilities of artillery preparation.

(ii) The intervals of time between these attacks must be as limited as possible, so as not to admit of the enemy recovering from the attack, assembling reserves, or reconstituting a new defensive organisation. With this object in view, it is necessary to employ a considerable density of artillery so as to reduce the period of preparation and regain the ability to manœuvre which batteries are losing through long periods of static operations.

(iii) The "liaison" between artillery and infantry must be rendered as intimate and continuous as possible, so that infantry may never be deprived of its artillery support With this object in view special "liaison detachments" must be found which the artillery will maintain with the infantry, the realisation of combined command posts must also be aimed at.

5. Deductions drawn by the end of 1915.

During the period under review the arsenals and factories of

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all belligerents had been working at top pressure. Guns and ammunition were being turned out as fast as the resources of each country admitted. The growth of artillery power had been making rapid strides, whilst artillery tactics and organisation were endeavouring to adjust themselves to this rapid growth so as to admit of the full power being used to the best effect. A few moments will not be misspent in examining briefly the artillery tactics which had been gradually shaping themselves during the previous year's fighting.

(a) *Destruction as opposed to neutralisation.*

Mobility had been lost, it was essential that some solution should be found whereby the power of movement could be regained since success could only be achieved through this means. Our loss of mobility was due in the first place to two direct causes :—

(i) Hostile fire power.
(ii) Hostile obstacles.

Of the above the fire power was dependent on the obstacle for the degree of its efficiency, but on the other hand the obstacle was dependent for its existence on the fire power which it protected. In order to regain our mobility two methods presented themselves :—

(i) An endeavour to destroy both hostile obstacles and hostile fire power by means of the artillery, thus restoring to the infantry its lost power of mobility.
(ii) The neutralisation of the hostile fire power by the artillery for such a period as to restore the infantry sufficient mobility to complete the destruction of the fire power through its own means.

Destructions executed through the medium of artillery must necessarily be a lengthy and deliberate process, since the gun is not a weapon of precision. Neutralisation, on the other hand, is greatly favoured by the rapidity and intensity of its execution. Consequently the adoption of a policy of destruction must necessarily lead to a sacrifice of secrecy which would not have been necessary had neutralisation been employed.

We have seen, however, that during 1915 our attention became gradually riveted on the ever increasing hostile obstacles, and as a

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result we were drawn into a destructive policy. In the first place we sought the destruction of wire entanglements protecting the trench systems, subsequently the trenches themselves were included, closely followed by the rifles and machine guns defending them, and finally the hostile artillery itself. The battle of Neuve Chapelle had demonstrated the neutralising properties of artillery even with unsuitable ammunition and elementary methods, but we misread the deductions to be drawn from this engagement and attributed any successes we gained to the destruction we had achieved. We were consequently definitely committed to a destructive artillery policy to which we adhered till the latter end of 1917.

(b) *Artillery Control.*

In the control of the artillery we had made distinct strides during the period we have considered. Such progress was naturally attended by a process of trial of error and accompanied by drastic swings of the pendulum. Starting with a system of decentralisation, we endeavoured to remedy its defects by substituting one of extreme centralisation only to return to a more moderate and elastic system. By the end of 1915 we had at any rate realised one important fact, the necessity for centralisation in the preparation and initial stages of an attack followed by decentralisation in its execution.

(c) *Counter-battery tactics.*

The fighting of 1914 and 1915 had taught us that the artillery duel of old still existed, but in a new form necessitating the employment of scientific means and methods. We were also beginning to appreciate the fact that in order to derive the best advantage from the various sources of information concerning the hostile artillery to be engaged some co-ordinating head to the system was required. These thoughts were, however, still only in their most elementary form, we shall find another year's fighting required to crystallize these initial conceptions into actions.

(d) *Effect of artillery range on depth of penetration.*

With larger resources at their disposal the French had progressed one step further in the evolution of artillery tactics. They had come to realise that with the methods we were employing the depth of penetration of an attack was directly governed by

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the ranging power of the supporting artillery. Since the hostile artillery formed the backbone of the enemy's defence, the hostile battery areas should be included within the objectives of the attack, a procedure which was rendered difficult owing to greater ranging power of hostile artillery and defensive battery positions selected at long ranges from the front covered.

The period we have had under consideration cannot be looked upon as embracing the full growth of the artillery during the war. It has been selected since it covered the initial stages of the expansion which may well be compared to the rapid growth of childhood. Bodily growth was out-distancing mental development. The germs of many new thoughts existed, but had not yet reached sufficient maturity to ensure the proper application of the power we were creating. In the subsequent periods which we have selected growth still existed such as in the development from youth to manhood, accompanied by its usual errors due to lack of experience and judgment, leading us finally to the more ripened opinions of middle age.

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ARTILLERY BRIGADE TACTICAL EXERCISES.

By Bt. Lieut.-Colonel E. C. Anstey, d.s.o., R.A.

V. OUTPOSTS.

IT is regretted that the map is not larger. It is not possible to include on it the positions both of the enemy and of the Main body. It must be accepted that there is a river (the R. Avon*) running in a S.W. direction about two miles N.W. of* Southcott*, only passable by bridges. The approaches across it, which concern the following problem, are three in number:—*

1. *via* Hill Barn *(M 49).*
2. *via* Swan *(M 09).*
3. *via the* Central Flying School.

Sunset is 1800 hours.

The 1st Division of a Southern Army to which it is acting as Advanced Guard, is advancing north-westwards covered by a cavalry brigade (less the horse battery) and some armoured cars.

The Advanced Guard of the 1st Division consists of the following:—

1 Squadron Cavalry (less 1 Troop).
10th Field Brigade, R.A.
21st Pack Battery, R.A.
3rd Field Company, R.E.
3rd Infantry Brigade.
"A" Company, 1st Battn., Royal Tank Corps.
1 Section D.A.C.
3rd Field Ambulance.

The situation at 1630 hours is as follows:—

The head of the advanced guard is at Lower House Farm (M 43).

The cavalry brigade reports sharp action with armoured cars and infantry brought up in lorries. Their line is now stabilised northeast and southwest through Southcott (M 09). Cavalry brigade headquarters is at Winter's Penning (M 27).

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The latest air report states that at 1425 hours heads of long columns were halted on each of the three approaches about 1 mile northwest of the River AVON. Enemy cavalry could be seen in strength 1½-2 miles southeast of the river, covering all three crossings.

Thus the Southern cavalry brigade has been forestalled in their attempt to seize the crossings of the River AVON.

The Divisional Commander is with the Advanced Guard Commander. He decides that (i) he will bivouac the Division east of the River BOURNE; (ii) if the enemy attacks he will occupy the east bank of the River BOURNE; (iii) the time required to occupy that position will be three hours; (iv) in accordance with the news received during the night he will decide whether to stand fast on the next day or to advance; (v) meanwhile the advanced guard will form the outposts for the night.

The cavalry has orders to withdraw behind the outposts at 1830 hours, leaving standing patrols of half sections of armoured cars each :—

(a) 2 miles N.W. of HILL BARN.
(b) Road junction M 0294.
(c) 2½ miles N.W. of CENTRAL FLYING SCHOOL ridge.

The cavalry will resume their protective duties at 0530 hours next morning.

The above are issued as orders at 1645 hours and the information is added that an air report just dropped says there is nothing to add to the 1425 report.

The advanced guard commander at once decides to take his senior artillery and tank officers and his brigade machine gun officer up with him in a motor (which the divisional staff has placed at his disposal) and visit the cavalry brigade headquarters. Meanwhile the advanced guard is to concentrate in and about MARLBOROUGH ROAD PLANTATION (M 45). The vanguard is to advance to DOWN FARM (M 27) and be prepared to take up a covering position if required. The brigade signalling officer (for whom there is no room in the motor) and the battalion commanders are to rendezvous at MILKING BUSHES (M 36). The O.C. 10th Field Brigade, R.A., (Lt.-Col. Gunner) orders battery commanders with their staffs to rendezvous also at MILKING BUSHES.

The cavalry brigade commander confirms the situation as

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already given to the advanced guard commander (Col. Smith), points out on the ground the position of the standing patrols, and says that an air report just dropped says troops could be seen crossing the river on all three approaches. He estimates he has about two cavalry regiments, two companies infantry and perhaps six armoured cars in front of him.

Col. Smith asks particularly as to the present position of the southern armoured cars and is told one section is on each road, of which one half section is co-operating in each case with the forward troops and one half section is being held in reserve under cover behind the top of the scarp. The cavalry commander agrees to leaving these reserve armoured cars out in their present positions until the outpost line has been occupied.

Col. Smith points out to the officers with him that there are three possible lines for him to occupy :—

A. MILTON HILL—PEWSEY DOWN.

B. EASTON CLUMP—HILL 170 (M 24).

C. CROWDOWN CLUMP (M 57-58)—WEATHER HILL (M 41).

Lt.-Col. Gunner says he would like to see line A occupied so as to give him the wonderful observation from the scarp.

But Col. Smith shakes his head. "It is too far away," he says. "The infantry would arrive in the dark. It is nearly five o'clock already. We could not get the leading company to the line before six. Besides I think it is too far away from the main body."

Gunner. "Will you take line B then? In the early morning the observation from EASTON CLUMP will be invaluable."

Smith. "We could occupy the centre and left but the right is just as far away as line A. Moreover the line is too long for me. On the other hand line C is too close on the left to the River BOURNE. So I decide to compromise on the line CROWDOWN CLUMP through LINDEN COPSE to HILL 170. I will divide it into three sectors, AUGHTON DOWN inclusive to the right sector and the MILKING BUSHES road inclusive to the centre sector. What can you do for us in the time available, Gunner? With the enemy as threatening as he is I think we ought to have all four batteries in action."

Gunner. "Very little, I am afraid. We can arrange anti-tank and anti-armoured car defence on the three main approaches; and

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I think I may be able to put the fire of one battery on each approach if required as long as you do not ask me to shoot within 600 yds. of the infantry. I will affiliate the 37th, 38th and 39th to the right, centre and left sectors respectively; and I recommend one pack section being given to each battalion as close support guns."

There being no time to be lost, they motor back to MILKING BUSHES which the battalion commanders have just reached, and Col. Smith issues verbal orders as follows:—

1. (a) An enemy force consisting of cavalry, armoured cars and infantry in lorries, strength estimated at two cavalry regiments, two companies infantry and six armoured cars, has been checked by our cavalry brigade on a N.E. and S.W. line through SOUTHCOTT. Three columns, one on each road (totalling probably one Division), were approaching the River AVON at about 1430 hours and some portion of them certainly were crossing at about 1630 hours.

(b) Our cavalry will be withdrawing from our front at 1830 hours until 0530 hours to-morrow morning, leaving standing patrols of half sections armoured cars each:—

(i) 2 miles N.W. of HILL BARN.
(ii) Road junction M 0294.
(iii) 2½ miles N.W. of CENTRAL FLYING SCHOOL ridge.

Other half sections of armoured cars now in reserve on each road just south of the scarp are remaining out until we are in position.

Our division is bivouacking for the night east of the River BOURNE and in case of attack will require three hours to occupy the east bank for defence.

2. The advanced guard will at once take up an outpost position from CROWDOWN CLUMP to HILL 170 and will be prepared to maintain their position to-morrow by daylight if required.

The vanguard is moving to half mile S.E. of DOWN FARM and will remain there until the centre battalion is in position when it will withdraw into reserve.

3. Right Sector. CROWDOWN CLUMP—AUGHTON DOWN—SCRUBS. 2nd Bn. K.O.Y.L.I.

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Centre Sector. HOG DOWN—LINDEN COPSE—INFIRMARY COPSE to ROUND COPSE (M 4157). 1st Bn. D.C.L.I.
Left Sector. WIREN COPSE—HILL 170. 2nd Bn. K.O.S.B.
Reserve. 2nd Bn. S.W.B. in area HOME FARM—MANOR HOUSE—UPPER EVERLEY.

Machine gun platoons will remain with battalions.

4. (a) Artillery are affiliated and placed under the orders of units as under :—

37th Batty. affiliated to 2nd K.O.Y.L.I.
38th ,, ,, 1st D.C.L.I.
39th ,, ,, 2nd K.O.S.B.

Each of the above battalions will be closely supported by a section of the 21st Pack Battery for anti-tank and anti-armoured car purposes.

(b) Artillery fire will be arranged on main approaches only.

5. "A" Company, Royal Tank Corps, will be concealed in HAZLEBERRY PLANTATION.

6. Brigade ammunition reserve will be located at OLDLANDS BARN (M 64). Other administrative instructions will be issued later.

7. (a) My report centre cross tracks M 5951.

(b) A brigade cable will be laid from my report centre to cross roads at M 4955 and thence to earthwork M 5868. A separate cable will be run from the brigade report centre to EVERLEY RECTORY.

(c) A V/T station will be established by 1800 hours on HILL 160.

8. Any questions?

During the interview with the cavalry brigade and the run back in the motor, Lt.-Col. Gunner has been arguing to himself as follows :—

The time is too short for any but the simplest plan. Batteries will not get more than three-quarters to one hour for reconnaissance and preliminary arrangements. Registration is not possible with the cavalry out in front. Now there are three approaches, all with some long straights. Can we place batteries in prolongation of those straights on which they can get their line by aiming posts? If so direction is then assured and the range can be estimated or

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taken from the map to within 500 yds. certainly which will be good enough for the purpose. Let us examine the approaches in turn :—

A. The right approach. , There is a stretch of road 450 yds. long running N.N.W. in the upper half of Sq. 48. On the prolongation of that there is obviously a battery position on THORNHILL DOWN at a range of about 3400 yds. The obstacles to getting the line will be the shoulder of EASTON HILL and AUGHTON DOWN. They can put flags in line with the road on EASTON HILL and aiming posts in line with the flags on AUGHTON DOWN if they are quick enough. That seems therefore feasible.

B. The centre. There is a straight stretch of road from MILKING BUSHES running N.W. There is a battery position on the prolongation of this just N. of 160, at a range of 3450 yds. The obstacles to getting the line without calculations are INFIRMARY COPSE and the shoulder at 180 in Sq. 45. The battery must traverse back through the copse and put their aiming posts on the shoulder. It is awkward unless INFIRMARY COPSE is very thin. But they are close to it on the ground and can get to work at once and should be able to do it.

C. The left. There is a stretch near the Tumuli at M 1652, with a battery position on the north part of GORE DOWN. But the range is 4400 yds. which makes estimation more uncertain and the plantations round HOME FARM are more awkward than INFIRMARY COPSE. The alternative is to put the left gun on the line of the prolongation of the road about M 4247, which is rather close to WIREN COPSE. But this cannot be helped and we had better make it so.

The howitzer battery can be put alongside the centre battery and take the line from them, firing if required with say 400 more yards' range.

Lt.-Col. Gunner points out his conclusions rapidly to Col. Smith before the latter gives his orders out. Col. Smith does not like the suggested target on the right as he says it is too far away from the infantry. He would rather have the shell falling about the bend of the valley at M 4776. Lt.-Col. Gunner says he can manage that by putting his guns on INHAM DOWN at about 1500 yds. at which range he can calculate pretty well to within 200 yds. for certain. Will that be good enough? Col. Smith agrees.

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Lt.-Col. Gunner accordingly issues his verbal orders. There is no excuse for not doing this in the correct form. For it is essential that the battery commanders should know all there is to be known about the enemy and especially about the cavalry and armoured cars in front; about the position of the infantry; communication arrangements, etc.

He therefore gives out his orders in exactly the same way as Col. Smith as regards the first three paragraphs. Strictly speaking paras. 2 and 3 of course form part of para. 1 (b) of the artillery orders. He then proceeds as follows:—

2. The 10th Field Brigade and the 21st Pack Battery will support the outposts by

(i) Arranging anti-tank fire on the three main approaches;
and (ii) laying out night lines on certain portions of the same approaches.

3. 37th Battery, you are affiliated to the 2nd K.O.Y.L.I. in the right sector. You see that bend of the valley about M 4676? Put your guns somewhere on INHAM DOWN in prolongation of the bit of valley south of EASTON HILL and get your line by the aiming post method so as to ensure that your line is absolutely accurate. Then calculate your range as best you can. Of course you cannot register.

38th Battery, you are affiliated to 1st D.C.L.I. in the centre sector. You have got to get your battery in prolongation of that bit of road running N.W. from MILKING BUSHES and get a true line on it if possible by aiming post and not by calculation. As you see you will have to traverse your line back through INFIRMARY COPSE; but I think you ought to have just enough time to do it. Accuracy of line is the important thing; for then small inaccuracies of range will not matter.

39th Battery, you are affiliated to the 3rd K.O.S.B. in the left sector. You treat the stretch of road near the Tumuli at M 1652 in the same manner. I think you will find probably you will have to put your left gun on the edge of the plantation at about M 4247. It is rather close up but that does not matter.

40th Battery, you will come into action alongside the 38th and take the line from them. Put 400 yds. more range on than the 38th.

4. Fire will be opened on orders from me or at the request

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of your affiliated battalion commander. During the night the ammunition expenditure is not to exceed 30 rounds a gun without reference to me.

5. Section D.A.C. will be at COURT FARM in M 83.

6. My report centre will be with the outpost commander at the cross tracks M 5951.

Cable will be run out to the 37th and 39th Batteries. 38th and 40th will communicate by orderly.

3rd Inf. Brigade is establishing a V/T station on Hill 160.

3rd Inf. Brigade cable will be running to the neighbourhood of each battalion headquarters.

7. Any questions?

During the night orders are received from the Division to the effect that the Division is going to halt for one day in its present position. The outposts will remain unchanged. In case of attack they must be prepared to maintain their position for three hours while the Division is occupying the defensive position selected for it, and the outposts will then be ready to withdraw across the River BOURNE. The cavalry will adhere to their former orders and will move out at 0530 hours with a view to establishing contact with the enemy.

Col. Smith holds a conference attended by his staff and by his artillery and tank commanders. He begins by announcing that after consultation with his brigade machine gun officer he has determined to hold his present line. Lt.-Col. Gunner urges strongly that EASTON CLUMP should be held not only for the sake of the observation obtainable from it but also to deny it to the enemy. He points out that it commands a view right into the centre of their position.

Smith. "That is perfectly true, and worse still the CLUMP forms a tactical feature most favourable for an enemy attempting to turn our right. It also provides the enemy with a covered line of approach to comparatively short range. Nevertheless it lengthens our line so much to hold it that we must make the best of it and let the enemy have it."

Gunner. "Very good, Sir. But I cannot bear to see such excellent observation thrown away altogether. We are neither using the full delaying power of long range gun fire, nor are we

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helping the cavalry back assuming that they get out in front again at 0530 hours. I suggest therefore that two batteries should be pushed out to MILTON HILL at daylight with a tank escort. It will make the enemy think the scarp is held and slow down their approach. We can remain until the cavalry in their withdrawal have reached the edge of the scarp and our O.P's there can register the other batteries on the main approaches at the foot of the hill."

Smith. "What do you want the escort for?"

Gunner. "In case the cavalry are chased back in a hurry in the morning, especially by tanks, I want protection for the few minutes necessary to limber up and get a start back down the hill."

Col. Smith objects to employing his tanks prematurely and piecemeal. Lt.-Col. Gunner points out that only a tank escort will meet the case, for the danger he has in mind is a tank attack when the batteries are limbered up and cannot protect themselves; nor could the cavalry, unprovided with anti-tank weapons, protect them either. It is quite possible the tanks will not be called on to help them at all and the value of the long range fire may be so great that it is surely permissible to use up a little of the tank energy to make it possible. The tank commander admits that as the tanks can go forward open and will be remaining in observation when they are out there, the strain on the crews will be negligible and he would not object to seeing a section used in that way.

Col. Smith accordingly agrees to the proposal provided it is understood that the guns do not move forward until the cavalry report the scarp in their possession. He allots a section of tanks as escort.

"Now, Tanks," he continues, "how much of this position we are in is tank-proof?"

Tanks. "I doubt whether any of it is strictly speaking tank-proof. But certainly these woods are unfavourable for attacking tanks. I should say the most favourable ground of all is between SOUTHGROVE COPSE and EVERLEY ASHES and the copses S.E. of it. Also the approaches to that area are well covered. To the left of EVERLEY the trees of WEATHER HILL FIRS and the steep slopes of SIDBURY would probably be avoided by the attacking machines if possible."

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Smith. "Right. I think, too, that if we hold up the advanced guards and the enemy decides to develop a heavier attack, he will do so by his left. By his right he has to come over successive ridges and we should see him in good time. Now I propose to put your company in ambush in SOUTHGROVE COPSE; rely on you for my anti-tank defence on that flank; and put the anti-tank guns on our left. What do you say to that?"

Tanks. "Where do you anticipate the enemy coming in exactly on our right?"

Smith. "I am guessing that something of this sort may happen. The advanced guards attack on each road with a battalion each perhaps. I think we ought to hold them up. Owing to the way the roads converge the enemy's left and centre leading battalions will be already touching. Their Division will come up and take charge; will possibly extend the fight by their right; but more probably will put in reinforcements right round EASTON HILL and come in between that hill and SOUTHGROVE COPSE. By that time with any luck it will be about time for us to go and there may be an opportunity for a counter-stroke by our tanks to give us a good start."

Tanks. "I am afraid the enemy will come into SOUTHGROVE COPSE first and spot me."

Gunner. "I will try and keep them out and shepherd them where you want them. For instance you see the hollow south of GOLDENLANDS FARM? I had noted that as being dead to our machine guns and therefore one of our targets. But I suggest now that I leave it alone and try to put a belt along the road on the north-west face of the copse if there are any signs of the enemy approaching it from that direction and also try to make the top of EASTON HILL an unhealthy locality."

Tanks. "I agree. How are you going to support me when I make my attack?"

Gunner. "We cannot make any plans for close support in a situation we cannot foresee in detail. I will shell GOLDENLANDS FARM for certain as I take it you will not want to go in there. And we will watch EASTON HILL in case any anti-tank guns show up on it. They would have to come right to the crest to engage you."

Smith. "That satisfies me on the right. Now about the other

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two lines of attack. I want you to be able to put your shells into EVERLEY ASHES, the dead ground south of MILTON HILL FARM and up the valley west of EASTON HILL as I do not think we can get direct machine gun fire onto it."

Gunner. "What about the valley west of CROWDOWN CLUMP?"

Vickers (Brigade machine gun officer). "The m.g's are going to have a first class shoot into that from AUGHTON DOWN."

Smith. "Quite so. As for our left, if the enemy attacks just west of the centre road, he will not show up until he crosses the DOWN FARM ridge. That is 1800 yds. from the infantry and a little far for our machine guns which will be a bit further back. So I want you to be able to engage the whole of that ridge.

Gunner. "My batteries will be shooting on a very wide front and some of them may have to switch through 90 degrees. Will you want me to shoot any further to the left. What about an extension round that flank by the enemy's column coming up the left road?"

Smith. "I shall ask the Division whether the cavalry may be made responsible for my left. But I will be satisfied if you put the fire of three batteries and not four on the extreme right. I think you must be able to shoot as far to the left as LITTLECOTT DOWN with one battery at least. Will that help you?"

Gunner. "Yes, I can manage that better. Now for another point that is important for me. When the enemy's pressure becomes so great that the Division orders you to retire, how do you hope to be able to do it?"

Smith. "First we must get the infantry back from CROWDOWN CLUMP to 208.2 and 195, while the reserve battalion moves back to the spur north of WINDMILL PLANTATION and takes up a line thence to HAZLEBERRY PLANTATION. The second phase will be moving the centre and left battalions right back across the River BOURNE. The third and last phase will be retiring the right and reserve battalions across the BOURNE. This last phase should be covered by the divisional artillery and you need not concern yourself about it."

Lt.-Col. Gunner now is pretty clear where the enemy may be expected; the most probable areas for tank fights; where his own infantry are and how the machine guns are going to be used;

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where he has to be prepared to put his shells; and the nature of the retirement he will be called upon to cover. He has to decide where to put his guns to comply with these requirements.

It is obvious that the crux of the problem is the extremely wide fire zone he is being asked to cover. It is easier to switch a howitzer battery wide than an 18 pr. The widest zone he will therefore give to his howitzers provided that the enemy's probable gun positions come within that zone, because of course his howitzer battery will have to do the counter-battery work for him. That zone is from SOUTHGROVE COPSE to south of DOWN FARM and includes such likely hostile artillery positions as the MILTON HILL ridge and DOWN FARM ridge. The best observation for counter-battery work moreover is probably to be had from INHAM DOWN and 208.2 and a promising howitzer position handy to those points seems to be in the AUGHTON hollow (M 76). They will be able to stay there without moving until the end and slip across the river under cover. That therefore settles the howitzer battery.

Two 18 pr. batteries have got to be able to shoot from SOUTHGROVE COPSE down to the centre road. HARE DOWN and THORNHILL DOWN catch the eye as possible gun positions. But from them the zone would cover over 90 degrees which is too much. There is a little hollow (called MIDDLE DIP) running from S.W. of WINDMILL PLANTATION to Point 136.2 in Sq. 64 which might hold one battery. It is 5000 yds. from SOUTHGROVE COPSE, from the ridge above MILTON HILL FARM and from DOWN FARM, and the zone is about 70 degrees. Even if there is room for another battery in it, it is too far away from the right battalion for close co-operation with it, and one of these 18 pr. batteries has got to be affiliated to the right battalion. Why not put the 37th therefore somewhere in the AUGHTON hollow west of the howitzer battery? Range to MILTON HILL CLUMP will be only about 5000 yds. The 38th in what we call MIDDLE DIP can be affiliated to the centre battalion as it is now. If the battery commander can locate it in the LOWER PLANTATION hollow just behind MIDDLE DIP it might be better still as it could remain in action longer and get away across the river under cover at will. That must be for the B.C. to reconnoitre and determine.

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The third 18 pr. battery (39th) which has to support the left battalion might be located behind HILL 160 in Sq. 54 whence it could shoot obliquely into AUGHTON DOWN and HOGDOWN COPSE after the centre battalion has retired, until the left battalion is leaving the MARLBOROUGH ROAD COTTAGE line when it can get away down the valley behind HILL 160.

If the above positions prove satisfactory and are adopted, no battery need move until the second phase is in progress. If however the 38th Battery has to go into MIDDLE DIP, it would probably have to retire as the second phase starts.

So far satisfactory. But the intention was that when two batteries went forward in the morning, the two remaining batteries were to be registered onto the approaches up the scarp by forward O.P's at the last moment after the cavalry had retired. The howitzer battery will be only 5000 yds. from the hill by which the HILL BARN road climbs the scarp and can be usefully registered on it. But none of the 18 pr. batteries are much within 7000 yds. of the similar defile on the centre road which is rather too long a range for quick and accurate ranging. The 39th in its night position is within 5000 yds. however and a solution therefore is for that battery to remain where it is, be registered onto the scarp on the centre road, fire onto it at intervals until attack is threatened and then move back to their battle position. The telephone wire laid out for this registration may have to be abandoned.

This plan, having received the approval of Col. Smith, is issued in written orders in the following form :—

Secret.

10th Field Brigade, R.A. Operation Order No. x.

Copy No. 1.

11th March, 1926.

Ref. 1/20,000 Map No. XII E.

1. (a) No further information about the enemy.

(b) The 1st Division is remaining in its bivouacs to-day and the outposts are remaining in their present position. The Cavalry Brigade will be re-assuming its protective rôle from 0530 hours, 12th inst.

2. The 10th Field Brigade, R.A., will take up fresh positions from which it will

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i. Assist the cavalry in their eventual withdrawal if required.
ii. Delay the enemy's advance with long range fire.
iii. Help the infantry to maintain their positions.
iv. Cover the eventual retirement of the outposts.

3. The method of executing the order is given in the attached table.[1] Battery commanders will report the targets their affiliated battalion commanders ask them to arrange at the earliest possible moment indicating those on which they recommend the assistance of additional batteries.

4. No ammunition will be dumped in battery positions. The position of the section D.A.C. remains unchanged.

5. The registration and long range firing by the 37th and 38th Batteries will not begin without the Brigade Commander's orders, who will be accompanying those batteries forward. After the withdrawal of the forward O.P's from the MILTON HILL ridge the orders for opening fire will be issued by Brigade Headquarters.

6. 10th Field Brigade. Aid Post—SUNTON FARM (M 84).

Advanced dressing stations are being established on the right in AUGHTON FARM; on the left COURT FARM.

7. (a) 10th Field Brigade Hd. Qrs. INHAM DOWN.

(b) Cable will be run to the 38th and 39th batteries in their rear positions 37th and 40th batteries will establish their O.P's as close as convenient to Brigade Hd. Qrs.

(c) Divisional artery is being run via COWDOWN PLANTATION (M 95) and COLLINGBOURNE KINGSTON to INHAM DOWN. Signal Centres—SUNTON FARM, COLLINGBOURNE KINGSTON and INHAM DOWN opening at 0500 hours.

(d) The 3rd Infantry Brigade artery (cable) will be running from INHAM DOWN via earthwork to MARLBOROUGH ROAD PLANTATION and EVERLEY RECTORY with Signal centres at the above named points opening at 0500 hours.

8. Acknowledge.

(sd.) A. B. XYZ,
Capt., R.A.
Adj. 10th Field Brigade, R.A.

Issued personally to battery commanders and through signals to other recipients at 2325 hours.

[1] Facing *p. 110.*

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Copy No. 1. 37th Battery.
2. 38th ,,
3. 39th ,,
4. 40th ,,
5. 21st Pack Battery.
6. Section D.A.C.
7. C.O.
8. Staff Captain.
9. Signal Officer.
10. War Diary.
11. File.
12. 1st Divisional R.A.
13. 3rd Infantry Brigade.

Battery commanders show their orders to their affiliated battalion commanders and the brigade commander shows a copy to the C.O. of the reserve battalion who is doubtless at the outpost commander's headquarters. This is one of the advantages of affiliation.

* * * * * * * *

It may have been observed that the manner of presenting the appreciation has changed during the course of the series. In the first two studies (attack and defence) the appreciation was given in a slightly academic manner without crediting the infantry commander with any influence on it until after the plan had been formed and presented to him for his approval. It was explained at the time that it is excellent practice for artillery officers to deal with such problems in toto in that manner in order to become familiar with all the factors that enter into an artillery appreciation. It was not suggested that the whole responsibility for the formation of the artillery plan should be shouldered always by the gunner in that way.

Accordingly in the next two studies of the series (Advanced Guard and Rear Guard) an advance from the academic was made by representing the kind of conversation that should take place between the commanders of the different arms in which the influence of various factors is discussed and in which the infantry commander expresses his wishes; and it was shown in the resultant

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appreciation how many were borrowed thoughts and how many were the gunner's own ideas.

Though the appreciation, while distinguishing between the origin of its component parts, was given in toto again, it was not meant to imply that such a methodical consideration and review of the factors will be possible always. The standard of professional knowledge and the degree of proficiency in its practical application and in co-operation possessed by the officers concerned will affect greatly their manner of working together. The determining factor in procedure is the time available.

In the present example, which terminates the series, the variation in procedure imposed by time is underlined. First, a night outpost position has to be taken up with great rapidity; there is no time for any but the briefest exchange of views; and the gunner has to run through a little appreciation in his mind and present his conclusions to the outpost commander without other assistance. Later, however, orders are received to change the night into day outposts; the hours of darkness are available for the formation of plans and the issue of orders; all the officers concerned are on the spot; and a discussion is represented as taking place without undue haste. At the end of the discussion it will be seen that a point has been reached parallel to that point in an academically drafted appreciation at which the enemy's and our own action has been discussed; conclusions have been come to as to where it is desirable the shell should fall; and to round off the appreciation it is necessary to study battery locations, movements, and allotment of tasks.

Such, then, should be the procedure, detailed or cursory, as time permits; and its approximation to the ideal outlined here will depend largely on the professional accomplishments of the representatives of the arms concerned; on their familiarity with such co-operative action (i.e. on training and practice); and lastly on the co-ordinating ability of the force commander. For it must not be imagined that the discussion is a council of war. It is true that it may become one if the infantry or force commander is a weak character and does not know his work. What it should constitute is a meeting at which the commander picks the brains of his subordinates and encourages efficient co-operation between them

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by allowing them to hear one another's views and difficulties.

In certain circumstances a still further movement away from the unassisted solution of a tactical problem by the gunner should be made. In the late stages of a successful attack, when affiliated artillery has passed under the orders of the infantry commander with whom they are working, the situation changes so rapidly that the infantry commander will not employ his guns to the best advantage unless he is capable of deciding quickly on their tactical handling, with such assistance or suggestions from his senior artillery commander as time permits him to avail himself of. That this is very far from being an unattainable ideal has been proved in practice at the Senior Officers School in India where, *towards the end of the course*, the students are given on the ground a tactical exercise without troops of the above nature. By the time this exercise is reached the students are familiar with the formation and criticism of artillery plans and have lost that paralyzing and fallacious conviction so common in the army that the artillery is a sealed book to the other arms; and they have realised that the tactical handling of artillery requires remarkably little knowledge of gunnery. Consequently they approach the problem of handling, as brigade commanders, an artillery brigade and some pack guns placed under their orders with some confidence; and the results already achieved by certain infantry officers would do credit to any artilleryman.

Thus it behoves the artillery to fit themselves to meet the criticism of officers of other arms concerning their tactical plans and issue of orders. For a class of officer capable of such criticism is slowly being brought into being in India; and it seems almost credible that one day the tactical handling of artillery will receive at manœuvres and exercises the important attention it deserves.

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Battery.	Location.	O.P.	Zone of Fire.	Zone of Observation.	Air Call Zone.	Tasks.	Ammn.	Remarks.
37th	1. MILTON HILL RIDGE	No restriction	...	East of SOUTHCOTT GROVE (M18)	...	1. Support the Cavalry 2. Delay the enemy with long range fire	Not to exceed 30 rds. per gun	Advance to and retirement from this position by Brigade orders.
	2. AUGHTON DIP (M.76)	ditto	M7589 to DOWN FARM (excl.)	EASTON CLUMP to MILTON HILL (incl.)	LL calls only on or East of HILL BARN ROAD	1. Target A. 720980 to 712969 2. Target B. EASTON CLUMP 3. As requested by 2nd K.O.Y.L.I.	2 rds. p.g.p.m. Shrapnel ditto	Affiliated to 2nd K.O.Y.L.I.
38th	1. MILTON HILL RIDGE	ditto	...	West of SOUTHCOTT GROVE	...	As for 37th Battery	Not to exceed 3 rds. per gun	Advance to and retirement from this position by Brigade orders.
	2. In area WINDMILL PLANTATION—LOWER PLANTATION—HARE DOWN	ditto	M7196 to DOWN FARM (incl.)	MILTON HILL (excl.) to DOWN FARM (incl.)	LL calls only West of HILL BARN ROAD & East of the CENTRE ROAD	1. Target A. 700956 to 688940 2. Target B. 514943 to 504922 3. As requested by 1st D.C.L.I.	2 rds. p.g.p.m. Shrapnel ditto	Affiliated to 1st D.C.L.I.
39th	1. Present position	MILTON HILL	No change	SOUTHCOTT and 1 mile to the West	...	1. Register scarp on CENTRE ROAD and and employ intermittent harassing fire after withdrawal of Cavalry	Not exceeding 20 rds. per gun	Withdraw to position 2 on orders from Brigade H.Q. Affiliated to 3rd Btn., K.O.S.B.
	2. Near HILL 160	One on MILTON HILL No restrictions	CENTRE ROAD (incl.) to LITTLECOTT DOWN.	Earthwork (Sq. M26) to CHISENBURY WARREN	LL calls only West of CENTRE ROAD	1. Arrange targets as desired by 3rd K.O.S.B. 2. AUGHTON DOWN—HOGDOWN BRAKE, after retirement of Right and Centre Battalions	... Not exceeding 20 rds. per gun	
40th	Hollow W. of AUGHTON	No further restrictions	M7499 to DOWN FARM (incl.)	EASTON CLUMP to PEWSEY DOWN	All within range	1. Road up scarp in Sq. 39. 2. Counter Battery 3. Target A. M710970 to 700958 4. Target B. GOLDENLANDS FARM		To be registered onto Target (1) by O.P. established on MILTON HILL as soon as re-occupied by Cavalry.

21st Pack Battery. One Section remains in Close Support of each forward Battalion. Battery Commander will co-ordinate Anti-Tank Defence South of CENTRE ROAD and report arrangements made to Brigade H.Q.

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THE PASSING OF THE DRIVER.

By Major-General G. H. A. White, C.B., C.M.G., D.S.O.

"It has been decided that as regards future enlistments the rank of Driver will cease to exist in the Royal Regiment of Artillery."

THE above extract from Army Order 429 of 1925 must be regarded as a further step towards the substitution of mechanical for horse draught in the Royal Artillery; indeed it would almost seem that the word "driver" (except in relation to golf clubs) would disappear not only from the Regiment but from the language, for "chauffeurs" have come to stay, and drivers of horses in civilian life are now few and far between. It would be easy to sentimentalise over this latest change so significant of more revolutionary changes to come, but one feels that such an impulse should be repressed. It is natural to feel a pang at the disappearance of any institution one has come to look on as permanent, and the present writer must plead guilty to strong "die-hard" tendencies, but we are perhaps too prone to forget what such changes really mean—that whatever gibes may be levelled by politicians at the lack of "first-class brains" in this country, the inventive genius directed by our scientists towards the improvement of war materiel is as alert and vigorous as ever it was, and that England does not intend to be left behind in the international contest for efficiency in armament which must continue until the day when war is abolished.

The driver, at least under that name, will soon be but a memory, and it is thought that a short review of the history and services of the rank may be of interest.

In the early days of the Regiment the drivers were civilians obtained on a contract system, and were in fact mere yokels, until in 1794 a body of drivers was raised, not as an integral part of the Regiment, but as an auxiliary Corps under its own officers, from which the field batteries received their drivers. In 1797 the Corps

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consisted of 5 troops, each of 275 of all ranks, but its strength was altogether unequal to the manifold duties it was called upon to perform. Hence it was often necessary to revert to the old system, and in 1798 it is recorded that the Commandant of Woolwich inspected some guns manned by gunners of the 8th Battalion, R.A. These guns were each drawn by three horses in single file or "randem," which were driven by contract drivers on foot, dressed in white smocks with blue collars and cuffs, and armed with long carters' whips of the ordinary farm pattern. This "uniform" is depicted in a somewhat rare print, here reproduced, in the possession of the R.A. Institution. The turn-out must have appeared a strange combination of the sword and the ploughshare, and the spectator might have been forgiven for expecting to see a load of turnips behind the team rather than a gun.

In 1800 matters had not improved, and Sir Robert Gardiner thus describes the field batteries of that time :—

"Picture to yourself a few guns advancing towards a strongly posted enemy, drawn by horses in single file, driven by a civilian on foot wielding a carter's whip, the carriage of the gun receiving its direction from a trail-truck traversed by a handspike. We were an absolute encumbrance to the Army, and often a source of embarrassment to its movements."

This cumbrous system was in force in 1745 when "the cannon lost at Fontenoy," says the Gazette of 11th May, 1745, "were left behind for want of horses, the contractor with the Artillery having run off with them so early that they reached Brussels that day." At Prestonpans in the same year we lost our guns in precisely the same manner, and at Falkirk in 1746, of the seven guns captured by the Highlanders "not one would have been lost had not the drivers run off with the horses."

It became obvious that the system cried out for reform, and the establishment of a Drivers' Corps was certainly a step in the right direction, inasmuch as the drivers were now mounted and had each the control of a pair of horses, but it is difficult to see why they were not incorporated into the Regiment and enlisted under the military oath, which would have brought them under proper discipline and eliminated the various evils of the "yokel"

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system. The failure to adopt this course is the more mystifying from the fact that the superior efficiency of the Horse Artillery from having its own officers, men and horses regularly appointed and constantly attached to the same guns had become apparent. In the Horse Brigade the drivers were enlisted from the first, and the system, we are told, worked admirably. Colonel Hime says of the Drivers' Corps: "A fifth wheel was added to the coach, with all the unnecessary friction, correspondence, delay, and vexation it entails. In addition to these general evils there were two specific evils—divided command, and great, and for the most part unnecessary, expense."

As a fact the Drivers' Corps seems to have been a disorderly rabble, and the almost general bad conduct of these men was the subject of constant complaint by Artillery officers.

On the 17th September, 1801, the Corps was renamed "The Corps of Gunners and Drivers," and on the 3rd January, 1806, it became "The Corps of Royal Artillery Drivers," consisting of 11 troops, of which 1 troop of 62 drivers served as a Riding Establishment at Woolwich. This troop was separated from the rest in 1808 and became the independent Riding Establishment. In 1807 the Corps was placed under Artillery officers.

In 1822 the men were enlisted into the Artillery as "gunners and drivers," though in reality drivers ceased to exist (except in the Horse Artillery) until 1858, when special drivers were re-introduced, the Crimean and Indian Mutiny campaigns having shown the defects of the "gunner and driver" system. In 1859 the drivers were enlisted separately, a system which has remained in force up to the present time.

The Artillery driver as we know him is a man of many parts, as was shown in the late war, in which he was exposed to hardships and dangers no less trying than those of the gunners. In spite of cold and wet, of mud and fatigue, of the frequent shelling and bombing of back areas, and of hazardous expeditions in the supply of ammunition, the driver's spirits seldom flagged, and the Regiment fully recognises the part he played in upholding its best traditions. Gallantry under fire is not the least of his virtues, and many instances could be given of disasters averted solely through the coolness and intrepidity of the team drivers.

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A study of the Gazettes during the war period shows how varied were the duties required of the driver in trench warfare. They included the supply of ammunition and rations under heavy shell fire, their horses being used either in draught or in pack; service as telephonists and signallers "accompanying raiding parties and establishing telephone communication under heavy fire"; and forming working parties to help infantry dig and wire trenches. In six Gazettes taken at random between the years 1914-18 there are 15 awards to drivers of the Distinguished Conduct Medal or Military Medal for gallantry in action, besides numerous awards to young N.C.O's, many of whom had doubtless lately risen from driver's rank.

At Le Cateau on August 26th, 1914, Drivers Drain and Luke, as volunteers, saved their gun from falling into the hands of the enemy, although it was at the time under heavy fire from hostile infantry who were only 100 yards away. For this act they were both awarded the Victoria Cross.

There were many cases where drivers, left single-handed through their comrades in the team being killed, and sometimes even when wounded themselves, successfully controlled a whole team of frightened and bolting horses. In "Some episodes during battle-fighting on the Western Front" communicated by Major-Genl. Sir H. Uniacke to "The Gunner" (old issue), a story is related which for bravery and resource under trying circumstances would be hard to beat, and is worthy of quotation in full. The account of the incident is as follows:—

"In 1916 during the Battle of the Somme a G.S. wagon with a 6-horse team and a party of gunners under a N.C.O. was sent along the road between Pozières and Courcelette to collect material from wrecked German dug-outs, etc., for the purpose of constructing a new battery position.

"This duty was being carried out after dark, as the road by day was under direct enemy observation, and movement along it in daylight was consequently out of the question.

"Soon after a start had been made the Germans began to shell the road—after a little time the shelling became intense and the party were compelled to pull up under a roadside bank in order to try and get some shelter. Just as they did so a heavy shell

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landed in their midst, damaging the wagon rather badly and wounding more or less seriously the whole party, both men and horses, with the sole exception of the wheel driver. The terrified horses attempted to bolt, but this driver succeeded in stopping them and quietening them down, and clearing those who were rolling amongst the wounded men. He then proceeded to render 'first aid' to his comrades, binding up their wounds and placing them in the most sheltered spot he could find—the road was quite deserted and there was no-one capable of helping him.

"Having done this he placed them on two horses who were less seriously wounded than the others and took them back, two at a time, to the dressing station.

"When he had carried back all his comrades to safety in this manner, risking his own life every step of the way, he took off their putties and went back alone along the shelled road to the remaining four wounded horses, and utilised these putties to stanch their flow of blood and bandage them up. He then somehow succeeded in getting the wagon clear, and found that although badly knocked about it was still capable of being travelled at a walking pace. He hitched four horses on behind, hooked in the two strongest, and brought the whole lot slowly and painfully back to the battery wagon lines.

"The night was black dark, the road was being shelled and the man was entirely alone.

"It is regretted that the record of his name has been mislaid, but it is satisfactory to know that the humanity, devotion and courage shown by him were rewarded at the time by the grant of the Military Medal."

Another example may be quoted from the same source :—

"On the 21st March, 1918, D Battery, 150th Brigade, R.F.A., was in action near Heudicourt. The guns were in a valley, and the enemy drenched the position so heavily and continuously with gas shell of a 'persistent' nature that it became at length impossible to continue firing with any semblance of efficiency.

"A limber and a pair of horses came up in charge of Driver John Terry and, unaided, he moved the guns one by one out of the affected area on to the crest. Throughout the operation the enemy shelled the position with high explosive, and the route was a track through shell holes.

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"The whole of the guns were got into their new position well within an hour quite safely, the battery continuing to fire throughout.

"The endurance, resolution and courage displayed by this driver were truly admirable—but for him the operation could not have been carried out; but in bestowing a well-deserved meed of praise on the man, those humble heroes his horses must on no account be forgotten."

An all too incomplete summary of the services of our drivers in the Great War must conclude with a reference to Driver R. Adams, D.C.M., 43rd Battery, R.F.A., who was selected for inclusion in the War Commemoration Book under the heading "Some representative Artillerymen." The following record of his services is given :—

"From the many thousands who served in the Royal Regiment during the Great War it would be hard to select a more representative driver than R. Adams.

"He landed in France on September 9th, 1914, with the 34th Battery, 38th Brigade, R.F.A., 6th Division.

"Taking part in the final stages of the first Battle of the Marne, and the struggle on the Aisne, he subsequently went through the whole period of the first Battle of Ypres.

"His later services were with the 83rd Battery, 11th Brigade, R.F.A., and finally with the 43rd Battery of the 24th Brigade, R.F.A., with which battery he is still serving.

"A total of 3 years 318 days actually present and doing duty in the line with the British Armies on the Western Front is alone a record that any man may be proud of.

"Adams was awarded the Distinguished Conduct Medal on June 17th, 1915, and the Russian Cross of St. George for repeated acts of gallantry, and no-one deserved them more.

"To those who knew him he always represented the best type of the Field Artillery driver. His horses were invariably pictures; his harness in first-class order. Whatever the conditions he could always be relied on to have a turn-out to gladden one's eyes.

"His unfailing cheerfulness, his resolute courage, and his high sense of duty, were worth untold gold throughout the many strenuous days and nights when the guns had to be fed with wagon

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loads of ammunition drawn or 'packed' over roads and tracks torn by shell fire and almost impassable.

"Absolutely trustworthy and reliable in all respects, Adams will always be remembered by those who served with him as a model of all that that priceless soldier—the Field Artillery driver—should be."

The more recent impressions created by the Great War must not be allowed to eclipse in our minds the gallant deeds performed in other campaigns. The attempt to save the guns at Colenso was not the least heroic episode amongst many others in the Boer War. In connection with it four Victoria Crosses were awarded, and though no drivers were among the recipients several received the Distinguished Conduct Medal, and it cannot be doubted that these decorations were well earned, and that the drivers did the utmost that men could do in an enterprise where all the odds were against them.

Viewed in the perspective of that time both the Colenso reverse and the ambush at Koorn Spruit were disasters to our arms, but the latter was one which afforded Q Battery, R.H.A., an opportunity to distinguish itself. The story of the battery's fine performance on this occasion is too well known to need repetition here, except to mention that again four Victoria Crosses were awarded, the Commander-in-Chief deciding, in the words of the Gazette, "to treat the case as one of collective gallantry," and directing that "one officer should be selected for the decoration of the Victoria Cross by the officers, one non-commissioned officer by the non-commissioned officers, and two gunners or drivers by the gunners and drivers." The last alternative presented a problem, but it was solved by the selection of a gunner and driver, the latter being Driver Henry Glasock.

The following account by a contemporary writer describes how Driver F. G. Bradley, 69th Battery, R.F.A., earned his Victoria Cross at the action of Itala in Zululand on the 26th September, 1901:—

"Itala was a small fort, where a tiny force under Major Chapman had been posted. On the date mentioned a large body of Boers attacked the fort, and the defenders were soon desperately hard set . . . . Major Chapman called for volunteers to carry boxes of

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cartridges to the firing line. It was a desperate undertaking. To reach the hill a space of some 150 yards had to be traversed, every inch of which was swept by rifle fire . . . . Driver Lancaster of the Artillery went forward across the bullet-riven plain . . . . he fell badly wounded. As soon as Lancaster was brought down, Bradley and Gunner Rabb rushed out to his aid. They caught him up and whilst Rabb carried him back to cover, Bradley, with the help of Gunner Body, succeeded in getting ammunition to the plucky little band of infantry on the hill, thus enabling them to stem the tide of attack."

So much for the driver in war. To write of N.C.O's and gunners would be out of place in this article. We all know that their fighting spirit is no whit inferior to that of the drivers, and so long as the Regiment is thus served by its "other ranks" there can be no risk of its glory fading.

In peace time the driver displays merits of a different order, though even under peace conditions good nerve is an essential requirement of his calling. He must be ready to chance his luck over awkward places and treacherous ground, and there is always the knowledge that a mistake on the part of one horse may bring the whole team down. The increasingly popular institution of musical drives has produced a fairly large crop of accidents and at least one fatal one, but such risks are all in the day's work and it is right that youth should ignore them; nevertheless they may be recorded as evidence that the driver well earns his pay.

I confess to having cherished in my youth a secret passion for driving drill. Indulged in moderation this is not a vice. To instructors as well as pupils it may be said to impart desirable qualities and agreeable sensations, such as quickness of observation and movement, accuracy of eye, and a free and healthy circulation of the blood, while it affords (more especially to instructors) a wholesome exercise in control of the temper! For the driver has certain faults which seem ineradicable. He *will*, when saluting, hold his whip with the tips of his fingers as a conductor holds his baton. He will *not* close the thong on the stock. He loves (the lead driver) to march with his horses' muzzles glued to that of the gun he is following, and a fair division of labour is secured to the

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team only by constant supervision on the part of the section commander. But the striving to correct these faults and to induce that combination amongst the drivers in each team by which alone good drill with taut traces is possible, added to the exhilaration of being carried at a quick pace by a live animal, and the occasional diversion of a horse down or a leg over a trace—all these are differentiating factors between horse- and machine-drill which in my humble opinion lend a superior interest to the former. The alliterative pastime of dragon driving drill is no doubt an affair of greater precision and may possess charms of its own, but it cannot provide the same healthy exercise, and if my small experience of internal combustion engines is a true guide, the dragon as compared with the horse fails in at least one fundamental respect—the colder the weather the more reluctant the start. But this is perhaps a debatable point, and some might prefer a machine, though immobile, to the combined perils of a fresh horse, a slippery saddle and a frosty morning!

The old time prize driver was an artist at grooming and turn-out. His horses were his "alter-egos," and he spent most of his time off parade in the stables. Great was the competition in "spit and polish," and methods of producing a super-excellence of shine on steel and leather, evolved perhaps by years of patient research, were guarded as jealous secrets. I know that I am skating on thin ice when I suggest that the more meticulous inspections on squad parade by section commanders now perhaps classed as "old fogies" contributed in no small degree to the universally high standard of turn-out in the nineties and earlier. Let me add that I realise how conditions and customs must change, and that I yield to none in my respect for the present-day subaltern, before many of whose attainments his Victorian predecessor would have quailed. Nor am I suggesting that the modern driver is in any way inferior to his prototype; indeed the excellent appearance of the teams in some of the competitions last summer was equal to the best efforts of the "old masters," but times are more strenuous that they used to be, and it is probable that there is less opportunity for cultivating the higher flights of the driver's art than in the old spacious days.

For some time past the distinction between gunners and drivers has been less marked than formerly. Gunners are taught riding

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drill and drivers gun drill, the wearing of spurs when walking out being common to all. One remembers the time when gunners being denied this privilege were unfairly handicapped (or so it was alleged) in the competition for feminine favours.

It appears to me also that there is now less difference in physique between the two ranks, and that the old-fashioned "stocky" driver with round thighs and calves has given place to a longer and "lathier" type, but perhaps I am mistaken in this. In any case the word driver has been used as an epithet to describe both physically and morally the "bull-dog breed," while it is noticeable that many of the worlds great men have been of the typical driver stamp. Napoleon himself, who was an Artilleryman, would doubtless have been a driver had he enlisted in the ranks, and in modern times we have had the type reproduced in Lord Roberts and Lord Ypres.

And so it is decreed that the driver must go. But his services to his Regiment and his country will not be forgotten, and it is consoling to reflect that on the R.A. Memorial of the Great War he will still live in bronze, and in a form but little idealised; indeed the driver's figure is perhaps the most life-like and satisfying of those which surround the Memorial.

Regimental officers have all known clean drivers and dirty drivers, brilliant but lazy drivers, dull but plodding drivers, but in reviewing the rank as a whole the few black sheep are forgotten, and we remember only with appreciation how well the vast majority have played the game for us. Where horse-drawn vehicles remain the driver will doubtless continue to function under another name, but officially the Army takes leave of him. It will do so with regret, and with gratitude to a body of men who in a long and honourable history have delivered their comrades of all arms out of many a tight place.

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ARTILLERY ORGANISATION.

[*The following is a broad and much abbreviated translation by Brig.-Genl. W. Evans*, C.M.G., D.S.O., *of an article entitled* "Organisation rationelle d'un système d'Artillerie." by Commandant Buchalet—*which appeared in the French* Revue d'Artillerie *of August, 1925.*]

Introduction.

THE present day French artillery organisation as far as its division into batteries, *groupes*[1] and regiments, derives from 1914, or is the result, perhaps hastily arrived at, of war experience. The allotment of guns, in particular, is rather the adaptation of an existing state of affairs to the needs of the moment, than a methodical and deeply thought out plan. It is true that this organisation has stood the test of war, but this does not mean that it cannot be improved on. Before passing to the questions to be discussed (mechanicalisation, divisional howitzers, organisation of smaller and higher units) the following is a brief analysis of the tasks of artillery in battle.

CHAPTER I.—THE TASKS OF ARTILLERY.

The Instruction on the tactical conduct of higher units defines the general task as follows: "the main task of artillery in battle is to support the infantry." This equally applies to the long range heavy artillery who engage guns and back areas, and the divisional artillery who directly support the infantry and accompany the attack with barrage fire.

The principal obstacles encountered by the infantry are:—

(1) Infantry fire weapons, machine guns in particular.
(2) Passive obstacles (defences).
(3) Hostile artillery.
(4) ,, aircraft.

[1] The *groupe* is equivalent to our brigade,

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(1) Machine Guns.

The number and power of automatic arms has increased to such a degree that it is only reasonable to suppose that in the next war infantry will have to attack strong fire positions, the backbone of which consists of m.g's. The points to consider are: Can the infantry neutralise or destroy such with their own weapons? In the attack on a rearguard this may be possible, with the assistance of the accompanying guns placed at their disposal. But these guns, which incidentally are only in an experimental stage, will be furnished with very few rounds and difficult to replenish in the zone where they will operate. Against a continuous line well provided with machine guns they will be useless.

The problem of replenishment alone seems to veto the provision of weapons of small calibre (e.g. 5 or 6$^{m/m}$) capable of neutralising by rapid fire hostile machine guns immediately before the assault. Moreover the necessity for a preliminary bombardment to shake the moral of the defenders has been clearly proved in the war.

This can only be produced by artillery with large quantities of ammunition—therefore firing from positions behind the zone where one can only move from shell hole to shell hole. Next it is most important for the infantry to be able to point out clearly to its artillery the targets to engage. But even if the infantry in the front line can identify on the map any targets they may see, how are they going to point them out to the artillery? They find it hard enough to get anything through to their own battalion commanders.

Infantry in the front line are often under fire from weapons they cannot locate, and which may be outside the zone of their division. Moreover communication with the artillery is constantly interrupted and always takes time—so much so that information often cannot be made use of when it is received.

The problem of liaison between artillery and infantry is yet to solve. Attacks that succeeded, did so thanks to the creeping barrage, or tanks, or a combination of the two. Modern tank experts are now asking for a creeping barrage of smoke, perhaps forgetting why tanks exist. Probably our tanks will find themselves confronted with anti-tank weapons (special m.g's or light guns) just as in 1914 our infantry found themselves up against ordinary m.g's.

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We must expect our enemy to furnish his line of resistance with these weapons in such numbers as to be practically indestructible. So that once more we shall get back to the old story of neutralisation by artillery bombardments. This temporary neutralisation will be closely combined with the movements of the infantry. Hence the official handbooks allow, not only for the preparation for the attack by the artillery, but also for fire—of so-called accompaniment. "Fire will accompany the infantry as closely as possible, either on an arranged plan or at the request for intervention by the infantry."

The great disadvantage of barrage fire is its wastefulness, and it is proposed nowadays that it should only cover a small depth and then change to successive concentrations onto localities judged to be well provided with fire weapons. This is rather a dangerous line of thought, as the very best and most up-to-date aerial photography will not show m.g. emplacements; defence, too, will be in depth and we must expect constant support of their infantry by hostile artillery. The problem then becomes how to render this form of fire less costly without sacrificing efficiency.

Firstly it must be understood that accompanying fire is zone fire. Its object is to cover an area with sufficient bursts to take effect on men who partially expose themselves to use their weapons. In the last war we used an unsuitable shell, the 75 H.E., whose burst only covers 15 m. width by 5 deep; producing a very local effect. If other considerations had allowed of it, it would have been far better to use shrapnel, the bursts of which at 3000 m. range cover a width of 20 m. and depth of 100 m.

Shrapnel was not used for the following reasons:—

(1) Difficulty of manufacture.

(2) Difficulty of obtaining regular bursts under all conditions.

(3) Fear of short shooting.

The first difficulty might be overcome either by stocking shrapnel during peace, or by intensive manufacture in the government factories, leaving the H.E. shell to be turned out by private factories.

The difficulty of regularity of action is purely technical. It should be soluble by a more careful study of time fuze fire and improvement of range tables, and by producing better fuzes. Up

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to now we have been speaking of fire from flat trajectory guns. Now supposing we seek to increase the effect of the bullet not by adding to its remaining velocity, but its weight, the question changes its aspect.

First principles do not necessitate an addition to the remaining velocity—true that by so doing a greater effect of depth is attained. But this effect could only be obtained at short ranges, such as were used before the war, and which are far from being normal. Moreover an increase of remaining velocity demands a considerable addition to the initial velocity. A projectile fired with a high initial velocity loses it very rapidly in the lower strata of the atmosphere, and fire from h.v. guns is very costly not only in ammunition but in gun tubes. Even supposing the difficulty of wearing can be got over there still remains heating. This heating is so great that a gun cannot fire continuously. In these circumstances it would seem necessary to consider increasing the power of the bullet, either by increasing its size, or by the adoption of a bullet of heavier metal such as tungsten. The height of burst then would not matter so much, a great consideration now that unobserved fire is so frequently used.

With high angle fire better effect is obtained on an enemy partly protected by shell holes, or behind a steep parapet. The beaten zone will lose some of its depth but with a shrapnel shell will still be greater than that of our present 75 H.E. With a shrapnel shell of 90 to 100$^{m/m}$ calibre, one might reasonably hope to cover an area approaching 1000 m^2 instead of 75 m^2 as at present. If conditions of manufacture prevent the use of shrapnel, then one should aim at producing H.E. shell of cast steel with systematic fragmentation.

Another difficulty with time series is the danger of short rounds due to bad fuze setting. This danger is not so great with high angle fire. If one substitutes percussion, high angle fire still has the following advantages: better surface effect with the instantaneous fuze, and greater accuracy; for all things being equal howitzer fire is more accurate than gun fire. In the following chapter the technical reasons which favour the adoption of a light howitzer are given. Howitzer fire makes it easier for infantry to keep close up to the barrage. The effect of shell fire from high velocity guns which seem to shave the heads of the infantry in the

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front line tends to affect their moral. It is our opinion that fire of accompaniment demands a howitzer. We conclude then by recommending the adoption of

(a) A shell with great superficial effect against troops in the open, either a shrapnel with heavy bullets for high angle fire, or a H.E. shell with systematic fragmentation.

(b) A light howitzer.

Passive obstacles.

The destruction of defences necessitates the use of howitzers of at least 150$^{m}/_{m}$ calibre. The 155C suffices against all obstacles hastily improvised on the field; but against entrenchments a 220$^{m}/_{m}$ at least must be used. It would appear advantageous if in order to reduce the different patterns in one system of artillery, a 240$^{m}/_{m}$ were substituted for the present 220 and 280.

An obstacle which one will find much developed after the first days of war will very likely be low wire, invisible from aircraft, and echeloned in depth. Against this obstacle the artillery will be practically powerless. With ranged and observed fire the 75 uses 800 rounds to cut a lane 25 m. wide in an entanglement 30 m. in depth, so that the ammunition question alone precludes this wire being cut by artillery.

If the position to be carried is not of great depth (e.g. crest where O.P's are situated) trench mortars might be used, their effect being good in all natures of ground and incomparably superior to that of the 75. Briefly the attack of a strongly organised position demands the use of howitzers of 155 and upwards (155, 240, 370, 400), trench mortars and special weapons (of the tank or electrically propelled torpedo natures) to deal with low wire organised in depth.

Artillery.

An active artillery can inflict terrible losses on infantry concentrated in preparatory positions for the assault. It is therefore reasonable for a commander to give his artillery the task of neutralising, if not destroying, the hostile artillery. Certain pre-war theorists had pronounced counter-battery work a failure, on the grounds that hostile artillery, like our own, practised concealment; but air observation has partially replaced faulty ground

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observation, and aerial photography and sound ranging have given counter battery organisations the advantages of which concealment had deprived them. The excellent results obtained by our counter battery fire in 1916, 1917 and more especially 1918, are recorded in many of the most trustworthy German documents, particularly in General von Bulow's report. Counter battery work, then, being a task of capital importance, it would appear inadvisable to decentralise the artillery too much.

From these considerations the following conclusions may be drawn :

(1) Not to over-specialise the tasks of the various natures of artillery on the battlefield, and not to deprive the higher command of fractions of artillery placed prematurely and definitely at the disposal of the infantry.

(2) To give artillery an organisation sufficiently flexible to allow of either decentralisation in so far as concerns direct infantry support, or centralisation for indirect infantry support (counter battery fire in particular).

(3) Artillery fire demands a certain minimum range. Now increased range is more economically arrived at by increase of calibre than by increase of initial velocity; hence the calibre of the light artillery should not be too much reduced.

(4) Artillery fire must be accurate. Now high angle fire is the more accurate; moreover accuracy decreases nearly proportionately as the range increases. It follows that for counter battery work not only as many howitzers as possible should be made use of but these should be pushed well to the front, even further forward than some of the direct support guns.

Even the partial destruction of a battery demands :

(1) Exact knowledge of the position of this battery, i.e. a well organised intelligence service and more especially an air observation service. The latter is so important as to render it necessary for artillery to have a proportion of aircraft of its own. Artillery needs this means of transport for its observers just as it requires motors and horses for the personnel of its batteries.

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(2) Observed fire. Counter battery series cannot be observed round by round. As a rule short concentrations are fired, the aeroplane observer being responsible that the target is included in the zone covered.

(3) A large amount of ammunition. Concentrations are in fact area shoots, and use up a great number of shell. We have already seen that they require centralised command.

Artillery protects itself from enemy observation by *camouflage*, the word being used in its widest sense, and by constantly moving position. Against zone fire the volume of the enemy's fire may be diminished by the dispersion of batteries, or even of guns. During the war battery positions became as heavily shelled as the infantry trenches. Consequently artillery must give up cramped and regular formations. Wide intervals between batteries, wide intervals between guns, etc., must be adopted. This will entail certain difficulties of command and supply.

To sum up, artillery organisation, when the importance of counter battery work is recognised, demands :—

(a) Flexibility, allowing of the centralisation of a large number of guns in the higher units.

(b) Preponderance of howitzers.

(c) Allotment to the artillery of a proportion of aviation.

(d) Maximum tactical mobility for heavy batteries.

AVIATION.

(Anti-aircraft artillery is not dealt with in this article.)

Artillery like other arms must have powerful machine guns and automatic guns of small calibre to deal with low flying aircraft. These will also be available for protection of troops against light tanks.

CHAPTER II.—HOWITZERS AND GUNS.

Necessity for a light howitzer.

One of the strongest reasons in favour of the adoption of a light howitzer is the necessity to engage slopes at all ranges. At short ranges the 75 with normal charge cannot search slopes such as constantly occur in ordinary ground. This results in the gun being kept well back from the front line at the commencement of an

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action. This means loss of power—for range is power—and shortly after an attack is launched difficulty in co-ordinating the action of infantry and artillery. It leads, too, to the crime of using the 43 kg. shell of the divisional howitzer to do what the 75 cannot accomplish. The inability of the 75 to search slopes was fatal in some of the attacks in the late war, especially at the Chemin des Dames in 1917. The adoption of a disc before the war was a fortunate solution, or rather an unfortunate one as its success prevented the adoption of a light howitzer. During the war a better solution but only applicable to trench warfare was the adoption of reduced charges. This practically turned the 75 into a howitzer in position warfare. Fire with reduced charges proved, contrary to expectation, appreciably more accurate than with normal charges, and gave guns the following advantages: they could cope with dead ground, and fire for longer periods without detriment to the equipment. Unfortunately fixed ammunition prevented this solution in moving war; supply then becomes difficult, and ammunition must not be supplied that does not allow of long ranges being used.

Nearly all artillerymen nowadays are of opinion that divisions should have light howitzers, but are divided as to the number. Some leading spirits would be glad to see a howitzer of 105 grouped with a very powerful 75 gun; this is the solution adopted by the American army whose new 75 has a range of about 13½ km. We are not of this opinion and shall give the reasons why we propose that the divisional artillery should be entirely composed of howitzers.

One of these reasons is the flexibility of manœuvre of the light howitzer in the task of direct support. We have seen above the advantage of high angle fire as regards point of impact. The high angle is equally important when the shell leaves the bore. The flat trajectory limits facility of manœuvre in that it excludes advantageous positions and often necessitates taking up positions which are exposed and without natural cover. In woods which are useful for the concealment of artillery, only glades easily ranged on can be used as positions by flat trajectory batteries firing at short ranges.

A word about the light guns that supported the infantry from the commencement of an attack. In order to avail themselves of

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their maximum range the command were right in pushing the 75 batteries up for attacks during the war, but it resulted in these batteries occupying positions which made it practically impossible for them to fire at the commencement of an attack owing to the flatness of their trajectory.

The light howitzer is admirably adapted for supporting infantry as it can go into action anywhere—behind a village, in a sunken road, in an orchard. It is easily concealed even from observation balloons, whereas the flat trajectory gun to get the best value must be in open country where it is easily ranged on.

It often happens that divisional artillery batteries must come into action near the O.P's, if quick action is demanded. The adoption of a howitzer would allow the distance between batteries and O.P's to be lessened, and so make it still easier to fire with effect when speed was demanded. Another strong reason for the adoption of a light howitzer is its capability of continuous and uninterrupted fire. The divisional artillery weapon is often called on by the infantry for long continued fire. Infantry suffer more and more on the modern battlefield. It is logical to support them morally as well as materially. Artillery can only do this by firing and firing a great deal. Now the high velocity gun is a costly weapon and must not fire for too long a period. Its action must be intermittent. The divisional gun firing by order of the infantry, should not be a high velocity gun. To select a gun of 75$^{m/m}$ with a range of 13½ kilos is a mistake we must not fall into.

It is obviously better to have in the division a gun ranging 13½ km. than a gun ranging 10 km. But that is not the point. What one wants to know is if a gun of 75 with 13½ km. range will be of more use than a howitzer ranging 10 km. The co-ordination of infantry action with that of artillery ranging 13½ km. is practically unobtainable. Now if a gun has a range of 14 km., it will be used at that range; as can be easily understood. On the other hand, a range of from 9 to 10 km. seems sufficient for a howitzer which can fire at the commencement of an attack from close to the front line. Without moving, it can support an infantry advance of 8 km. With a tenacious adversary an advance of more than 8 km. has seldom been realised in one day. A 75$^{m/m}$ gun with a range of 14 km. could not be used at less than 3 or 4 km.

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from the front line if one wanted to open fire from the start, so that its actual superiority in range would not exceed 2 km.

CHARACTERISTICS OF THE HOWITZER TO BE ADOPTED.

To realise a range of 9 to 10 km. with a maximum initial velocity of 400 m. the best calibre for a field howitzer would appear to be about 95m/m. Its weight would approximate to that of the 75 gun, or at any rate be less than that of the 90. It should be noted that the effect of the 95 shell used in the war was better than that of the 90 or 75. The "*obus explosif D*" contains a charge of 1400 gr. of H.E., or nearly double that of the 75 H.E., and the steel shell, similar to the normal 75 H.E., has a charge of 2 kg. 300 (the charge of the F.A. shell of the 145 is only 3 kg. 500). A highly charged shell of 95m/m has great superficial effect. The superficial effect of the H.E. shell D is double that of the 75. Finally the adoption of this calibre would allow of heavier bullets in the shrapnel shell.

The carriage should admit of fire up to 43°. Two charges would be absolutely necessary; but three would be better. The abolition of the cartridge case would still allow of a rate of fire of 6 rds. per minute; a rate amply sufficient in battle. The abolition of the cartridge case has a double advantage; economy of brass, and diminution of the weight of the ammunition carried. In calculating the weight of ammunition, the weight of the complete round, not merely that of the shell, has to be taken into account. Now the 95 round weighs about 14 kg., while the 75 weighs 10 kg., the effect of the 95 being quite double that of the 75.

If the high command object to the 95 on account of its weight, one might adopt a calibre of 90m/m, whose complete round weighs the same as that of the 75, with an effect considerably greater. In our opinion the added *power* is the more important, and we prefer the calibre of 95 or thereabouts, to a smaller one. This howitzer should have a wide field of fire: say 40°. A split trail which gives still greater facilities for high angle fire would allow of 60° traverse.

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Number of howitzers in the Division.

How many guns should be allotted to a division of 3 infantry regiments[1]? The solution adopted for the 75 at the end of the war was based on the following principle: it was not possible to give divisions the number of guns they required for an attack; so they were reinforced when necessary by units from the general artillery reserve, or by artillery belonging to units who were out of the line or in reserve. To-day the question presents a different aspect. In any case it seems better to give the division permanently the number of *guns* it requires, and only to have to consider reinforcement in ammunition. With a light howitzer capable of firing 200 rounds in the hour, the number of pieces necessary is much less, and as we shall see later in discussing mechanical transport it no longer appears as necessary as it did in 1918 to have light guns in the general artillery reserve.

By taking as a rough guide the number of 75's in the divisional artilleries, we can establish the number of light howitzers required per division. Three regiments of 75's were allotted per division, i.e. 108 guns. The ammunition expenditure of the 95 how. and the 75 gun being in the proportion of 5: 3 (200 to 120) one can then allow roughly 64 howitzers in place of 108 guns. One can work it out more accurately as follows: Suppose a front of attack for a division to be 2000 m. What frontage should be covered by a 95 light howitzer in direct support? At the end of the war we allowed, and do allow now, 100 m. for a four-gun 75 battery . . . . One howitzer per 50 m. would be sufficient, i.e. 40 howitzers to cover 2000 m. front. Now the effect of the 95 shell is nearly twice that of the 75, and the burst of the former produces a greater moral effect. It would then be possible, even with the present 95 H.E., to reduce the number of shell in the creeping barrage. . . . If we substitute for the present H.E. shell, a shrapnel shell, or a H.E. segment shell, one would be able to still further reduce the number.

It is as well to be cautious when making prophecies, so let us keep this number of 40 hows. for direct support tasks only. Protection fire has to be thought of and this would require at least a dozen howitzers. We thus arrive at a total of 52 howitzers, a number only slightly different from our previous calculation.

[1] Regiment = 3 battalions.

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But we must be prepared for the possible extension of the fronts of divisions. For a front of 3000 m. twenty more howitzers would be required. This would bring the total to 72 howitzers per division.

In *groupes* of three four-gun batteries, the 72 howitzers would form 6 *groupes*. In *groupes* of three six-gun batteries, they would form 3 *groupes*. We shall see later that this latter organisation is more economical generally.

CHAPTER III.—THE HEAVY DIVISIONAL ARTILLERY HOWITZER.

The allotment of the 155 C[1] to the divisional artillery dates from the war, which means that it was done for the best of reasons. But this is now open to argument, especially if we adopt a light howitzer. The following are the reasons given by those in favour of making the 155 C howitzer a divisional artillery weapon.

(1) The 155 C is used in direct support: it can search ground which the flat trajectory of the 75 cannot deal with.
(2) The destruction of obstacles is of primary importance to the infantry: it therefore devolves on the divisional artillery.

Regulations lay down that series fired in direct support shall "permit the infantry to reach the enemy before he has time to use his weapons effectively" . . . . "they consist either in the bombardment of the nearest objectives until the moment that the progress of the attack necessitates a lift, or in a dense and deep rolling barrage, followed up closely . . . ." Nothing in the letter nor the spirit of the regulation applies to a heavy howitzer.

The 1922 Instructions for artillery fire are more explicit. They allow for fire in direct support by the heavy artillery howitzers in the following cases:

(a) For slopes that 75's cannot deal with.
(b) To engage important points beyond the rolling barrage.
(c) In the absence of any indication of how the enemy defences are organised, they may be employed in firing a rolling barrage beyond that of the 75's.

Should we adopt a light howitzer, reason (1) no longer obtains.

[1] 155 C = 155^{m}/$_{m}$ *Canon court* (howitzer).

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The intervention of heavy howitzers on important points beyond the rolling barrage comes under the heading "protection." Instructions on the tactical conduct of higher units says, in para. 191 (*tirs de protection*): "Protective series are used to extend the action of fire of the direct support guns to the greatest depth possible, by neutralising points from whence the enemy can sweep with fire the ground over which the attack must pass." Neutralisation therefore is their task. To employ for this task a shell of 43 kg., whose effect is far less on personnel than the smaller shell, seems to us a mistake. Since the divisional artillery has light howitzers ranging up to 9 km., it is not logical to use a heavy howitzer.

Moreover Instructions for the tactical conduct of higher units, takes care not to detail the nature of the guns to be used for this protective fire. A rolling barrage by 155 C seems a mistake in any case. One cannot have it both ways: we seek either neutralisation of personnel, or destruction of hostile defences. In the former case we know that the mean point of impact of the 155 must be kept at least 400 m. beyond the infantry which means lifting the barrage at least 12 minutes before they reach the objective. This hiatus of 12 minutes defeats the object of the barrage, which is only effective if followed up closely by the infantry. Far better results would be obtained by raking fire from light guns.

Next, can material effect be obtained on defences, in the absence of information as to their whereabouts? This would not appear to be the right moment to send infantry to the attack; should it be done, the fire of 155 howitzers, zone fire, and necessarily thin, will not produce any destructive effect. To destroy defences requires accurate, hence observed fire, not merely zone fire.

Regulations lay down that the use of the 155 C in direct support should be the exception; it could be just as easily used for direct support if it formed part of the corps artillery, so the argument in favour of giving 155 C's to the divisional artillery, on account of its use in direct support, will not hold water.

Reason (2) is better. It seems logical to entrust to the divisional artillery the destruction of defences which infantry will have to attack. As the destruction of even improvised field fortifications demands a bigger calibre than 155, it would therefore seem quite sound to hand over all the artillery of destruction up to

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the 400 to the D.A. This was actually done during the big trench warfare attacks (Verdun, Somme, Malmaison). This makes it very difficult for the divisional C.R.A's staff except on occasions when the attack is mounted long before it takes place.

An argument sometimes put forward is that it is as well to keep some heavy artillery with divisions, to facilitate liaison between this arm and the infantry. The answer to this is that the corps artillery commander, when charged with destruction, divides the corps artillery into groups corresponding with the divisions in the line, and that group commanders will necessarily work in conjunction with the divisional artilleries concerned. This liaison from above will present no difficulty. As we have already said, everything points to handing over the 155 C to the corps.

The best reason of all is the usefulness of the 155 C for counter battery work. It is accurate, and sufficiently powerful to render untenable any battery position not concreted. From 3 km. behind the front line it can attack batteries 6 km. beyond: this is the zone in which the majority of hostile guns will be found. Now counter battery work is undertaken on a much wider front than that of a division, and often than that of a corps.

Finally we must remember that a corps commander must be in a position to control all available guns for an attack on a big scale, which must include other actions to cover and support it. This would entail the 155 C *groupes* being under the corps artillery commander. Briefly, there is no great objection to taking heavy howitzers away from the divisional artillery, and there are strong reasons for putting them with the corps artillery, or even with the general reserve of artillery *(artillerie portée)*.

Chapter IV.—Mechanical traction.

Mechanical traction for the artillery had been much discussed prior to the war, and practically given up as the result of unsatisfactory experiments. In August, 1914, only one group of tractor-drawn 120 existed. In January, 1918, the French army possessed over 200 heavy tractor-drawn batteries, not to mention the numerous regiments of 75 *portés*. This artillery formed in the hands of the high command, a mass whose power consisted in its great strategic mobility. It was capable of moving:

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Artillerie portée ... ... 500 km. in four days.
Specially organised heavy artillery 300 ,, ,,

The disadvantages attributed to mechanical traction are:

(1) Inferior tactical mobility.

(2) Difficulty to obtain motor-spirit in France in time of war.

It is true that in 1918 the 75 *artillerie portée* was more dependent on the nature of the ground and on roads than the horse-drawn 75's, but in the war of movement in 1918, the *groupes* of horse-drawn 75's also found themselves tied to the roads when looking for positions to enable them to get up enough ammunition: it was mainly on this account that the *batteries portées* tied themselves to roads. In any case the partial adoption of agricultural tractors of the "Cletrac" type, has considerably modified the situation now. A battery of 75's with suitable tractors could move in ground where horse teams could not. The War Ministry in the *Journal Officiel* of January 27th, 1925, lays down that tractors destined for the 155 C and the 75 must be able to take these guns into all the natures of ground in which the present horse-drawn artillery can move . . . .

There remains the objection of the supply of spirit . . . . In 1918 we calculated that mechanicalisation of the artillery (mobilised) would only mean an increase of 10% on the total consumption of spirit at that time; that is to say that the question of manufacturing motor spirit in France should be solved independently of the decision which would affect the motorisation of artillery.

The advantages of mechanical traction are:

(1) Strategic mobility.

(2) Ammunition supply is simplified.

(3) It is easier to train motor drivers than horse drivers.

(4) Mechanical traction alone permits of action in gas attacks.

(5) Motors are much more suitable to the spasmodic nature of a war of masses (i.e. motors eat nothing when not moving, and economise personnel).

For war in Central or Western Europe mechanical traction is the solution. It is only the limitation of resources that renders it necessary to keep a proportion of horse-traction.

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LIFE AND PROSPECTS IN KENYA COLONY.

By Colonel A. G. Arbuthnot, C.M.G., D.S.O.

I.

DURING the last few years Kenya has been decidedly in the limelight, the object of both criticism and eulogy. The trials she passed through during the bad years which followed the end of the war were sufficient to wreck any young colony; the high profits made during the war gave rise to very extravagant methods of production, and young industries, such as flax and sisal, were unable to stand the sudden fall in the market which occurred in 1920. The cost of cows, oxen and all farm implements and machinery remained absurdly high, land speculators were allowed a free hand, and the rush of new soldier settlers could scarcely have been given a worse reception. Coffee, the oldest established industry, alone kept its head and paid its way, if we are to exclude "profiteering" as an industry! To these trials must be added the attempt to juggle with the rate of exchange by fixing the local value of the rupee at two shillings. This was perhaps the greatest blow to many old established farmers and new settlers; to the former his legitimate "bank overdraft" was raised from the equivalent of £200 to £300 for each ~~Rs~~3000, and to the latter the value of his capital was reduced on importation by 33%. Behind everything lay the shadow of the "Indian Question" which, from 1920 till 1923, bid fair to make the country impossible as a British Colony.

That Kenya has weathered each and all of these trials speaks volumes for her vitality and for the dogged determination and hard work of her settlers. Though her difficulties may not be over, her future is assured. Drastic reduction of overhead charges, elimination of unjustifiable luxuries, reduction of railway and shipping freights, have placed even her most hard-hit industries on a sound basis, and brought many new ones to genuine prosperity. The country unquestionably offers great attractions and opportunities to the average Englishman with a small capital. To the soldier with a love for outdoor life, hard work, and good sport,

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it is specially attractive, and during the last two years I have received so many enquiries from serving and retired soldiers, many of them gunners, that I feel some notes on the life and conditions may be of use. From the various enquiries I have received I can perhaps form some judgment of the classes of men to whom the possibility of settling in Kenya is giving serious food for thought.

First there is the young fellow, fresh from Public School or 'Varsity, who yearns for the bigger, freer life that is offered by our colonies; to him the whole empire is open and calling, and he will probably go wherever he is offered the greatest advantages, or where he may have some relations or interests. If he selects Kenya, our youngest colony, his chances are probably as good as anywhere, but he must have a promise of some capital to be available when he is ready to be entrusted with it. For Kenya is not yet a country to go to in search of a job; settlers must work themselves, and few can afford unskilled white overseers or managers. There are, however, a large number of partially or fully developed farms where pupils of the right sort are wanted on very reasonable terms; for a payment of about £100 to £150 a year a pupil may be fed, housed and taught, and at the end of a year or so should be qualified to draw on his capital and start on his own; or he may then have a good chance of obtaining a job as a manager, or getting into a good partnership.

Then there is the serving soldier, loth to leave the army, but faced by a hopeless stagnation in promotion, and, if a married man, the perpetual house and servant question! Well, Kenya has some advantages which cannot be ignored; there is no "house problem," for you can build your own temporary house in a few weeks for, say, £25, and that should last you till your produce can build something better of stone, or brick, or timber, in two or three years' time. The servants may be trying, but many are quite good, and at any rate you don't have to cook your own meals and wash up! and there is no other colony where you have a white man's climate and black labour.

To the soldier who has retired, or is about to retire with a pension and a small capital, there is much to be said in favour of Kenya, and now is the time to go before land prices get higher. He sees himself faced by a big reduction in income and, what is

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far worse, no work to do! Hunting and shooting must go, and if he has children, education bills are probably rising. Unless he has considerable private means a bare existence is all he can look forward to in England of to-day. If he and his wife are fond of country pursuits, and the prospect of an idle existence in a villa fills both with dismay, if dances, theatres, entertainments, and the many demands of ultra-civilisation are not the breath of their lives, if both are gifted with enterprise and are ready to work, I can honestly recommend them to go to Kenya.

With a pension of, say, £400 to £500, and a capital of £3000, what can a man do in England compared with Kenya? There he and his wife, once established on their land, can live in comfort on £250 a year, and they have a right to expect in due course a return of 20% to 30% on their capital. The pension is all-important, however small it may be, as it is a safeguard against failure when the farm does not reach a productive stage as early as it should; the one essential is energy and readiness to work.

There need be no fear of dullness or boredom! there is work to do for everyone from dawn till dark. For the wife, besides the house ménage, there are the dairy and the garden, young stock and poultry, and many other odd jobs in which she can assist in the development of the home and farm. Congenial work, good climate and scenery, are wonderful antidotes to loneliness, but if this sort of life does not appeal to her, if she is not prepared to live for the first year or so in a grass hut or a rough-hewn cedar house, probably in "the blue" thirty to fifty miles from the railway and four or five from her nearest neighbour, she had better decide against the experiment! She will have no difficulty in picking up a good cook, and "house-boy," and these, with a "M'Toto" (small boy), will form her house staff. As to children, all the evidence I have seen or heard goes to prove that they do exceedingly well out there. I believe there are several quite good schools at Kijabe and Nairobi, but the time of course comes when they must be sent home, not on account of age or climate, but on account of education. As a matter of fact several of the families I have heard of who are thinking of going to Kenya are doing so because they believe that Kenya holds out better prospects for their children than England.

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There is one difficulty to be faced by the man with a wife and family, and that is where to put them on arrival while he is prospecting for land. Hotels are prohibitive for more than a few days. Some friends of mine have recently gone out with three sons and a daughter of 16, and are living in our house while they make up their minds as to where they mean to settle.[1] Without the loan of a house I do not quite know what they would have done. There are, however, a number of settlers who have given their names to the "Kenya Land Settlement Committee" as willing to take paying guests in order to help new settlers, and the Land Settlement Committee Office at 4 Buckingham Gate could give advice on this. It is most essential that no settler should be rushed into buying a farm, or for that matter anything else, till he has been some months in the country. A Somali pony or a Ford car may be considered exceptions, as one or both are essential to getting about and seeing the country. Failing some promise of accommodation I would advise the prospective settler with a family to go out first by himself for three or four months, and not bring out his family till he has bought some land and established himself on it.

To sum up, Kenya offers a grand life and good prospects of success to those who are suited to it. The essential qualities are :—

(1) Capital : For the single man a minimum of £150 a year for four years, and £2000 capital. For the married man an income of £250 a year or more, and £3000 capital.

(2) Characteristics : Enterprise, energy, and capacity for work and for managing labour. Knowledge of farming and elementary carpentry and building, are useful, but not essential; can be acquired out there. Love for an out-door, simple life is taken for granted.

II.

Farming in Kenya.

For the following notes on some of the most established and successful forms of farming in Kenya, I have drawn on my own experiences in 1921 to 1923, and am indebted for more recent

[1] Colonel and Mrs. Trent; they have now bought some land adjacent to ours, and are settling down with the intention of growing wheat.

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information to Capt. J. L. Deverell (late R.A.) who is now growing maize near Nakuru, after commencing with a coffee farm at Kyambu.

I. *Coffee.*

Coffee is the oldest established industry in Kenya, and had obtained its world market and made its name before the war; but as Kenya is only 25 years old its progress is remarkable.

Brazil supplies over 80% of the world's coffee, but it is of inferior quality when compared with the best grade, high priced produce of Costa Rica, Mysore, and Kenya; consequently the latter coffees are chiefly used for blending and seldom reach the consumer. During the last few years Kenya coffee has improved its position among the highest priced coffees on the London market, and has varied from an average of £85 a ton in 1923 to a maximum of £160 in 1924; it stands at present at about £140 a ton. Taking the average yield of an acre of four year old established coffee as 7 cwt., the cost of production, including shipping, etc., as £16 per acre, and the price obtained as £100 a ton or 100/- a cwt., the result is a nett profit of £19 an acre. Allowing for bad seasons, bad management or bad luck, we may write this down to £15 per acre, or £1500 yearly income from 100 acres of bearing coffee. That this estimate is not exaggerated will be seen when we realise that during the last two exceptional years there have been many instances of farms producing 15 cwt. per acre and selling at £140 a ton, showing a profit of over £80 per acre !

Coffee grows best between 4500 and 6000 feet, but the area of cultivation is strictly limited by rain and soil. It requires a great depth of rich chocolate loam soil and a rainfall of 45 to 60 inches. These conditions are found round Nairobi and Kyambu, Nyeri, Forthall and Riuru, where most of the available land has been taken up and developed, and fetches very high prices. Further afield there is undeveloped coffee land to be found, notably in Trans-Nzoia under the slopes of Mount Elgon and near the border of Uganda. This country was only roughly mapped out into "farms" after the war, and its prospects, with the railway rapidly approaching, are said to be very promising.

The prices of undeveloped coffee land are rising from £10 to £15 per acre, but in more distant areas land can still be obtained

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for less. An acre of bearing coffee is valued at from £60 to £85. The settler who is prepared to work hard, very hard, and develop his property gradually, should be able to bring 100 acres of coffee land into bearing on a capital of £3500, or £2500 plus an income of £200. More than this will be spent on the farm of course, but in the fourth year the coffee will begin to pay and after that can be relied upon to develop itself and produce a nett profit rising to £1500 in seven to ten years.

Most coffee farms run to about 300 acres, containing about 150 acres of coffee land, a few acres fit for maize, perhaps some fruit, and the rest rough grazing. Neighbours are plentiful, and in the developed districts there is probably tennis and polo. A settler, however, will be well advised not to decide on coffee till he has been some months attached to a coffee farm, and also seen other enterprises such as maize, wheat and stock. If the wilder life appeals to him, if he yearns for the open rolling downs, the virgin forest, the pioneer's axe and rifle, he may find coffee monotonous. If he values these more than tennis and bridge, and close neighbours, let him wander as we did through Nanyuki, Laikipia, the Uasin Gishu Plateau and Trans Nzoia, before he saddles himself with a farm. A Ford car or a motor bicycle will take him anywhere, except during the heavy rains, and every door is open to him.

II. *Maize.*

Kenya can grow more bags of maize to the acre than any other country, and in quality it now stands at the head of the London market. When it is realised that none was exported till 1922, the progress is truly remarkable, and it now rivals coffee as a paying proposition. This success is entirely due to the enterprise and combination of the maize growers.

Maize flourishes anywhere between 4000 and 7000 ft., and Nakuru and the Uasin Gishu Plateau are perhaps the main districts. Undeveloped land suitable for maize fetches £2 10s. to £4 per acre, and a developed farm with cattle and implements £7 to £10 per acre. Generally speaking about 4 to 5 acres of maize should give the same return as one acre of coffee, and slightly less capital is required to bring 450 acres into bearing by gradual methods.

There are three methods of embarking on a maize farm, and the choice depends on the amount of capital and energy available.

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The first is to buy a going concern including all gear, oxen, farm implements, buildings, etc., at from £8 to £10 per acre. Probably terms can be arranged, part cash down and balance in three to five years. Some capital must be kept in hand to purchase additional oxen and implements. The second is to pay cash down for undeveloped land; if within 10 miles of the railway this may fetch about £3 an acre, say £1500 for 500 acres, of which 400 is suitable for maize. To break in this 400 acres in two years will require considerable outlay and hard work. An approximate estimate of the cost would be:—

	£
Purchase of land and legal fees	1600
Clearing 400 acres	400
4 Teams of oxen @ £8 per ox	500
Ploughs, harrows, planters, etc.	300
House and farm buildings	100
2 Years' working expenses	500
2 Years' living expenses	400
	3800
Deduct 1st crop on 200 acres @ 4 bags per acre @ 10/- a bag	400
	£3400

During the third year the farm should produce:—

	£
2nd crop on 200 acres @ 8 bags an acre	800
1st ,, ,, 200 ,, ,, 4 ,, ,, ,,	400
	1200
Less 1 year's working expenses ... £400 and 1 year's living expenses £200	600
Nett Profit ...	£600

In the fourth and subsequent years the nett profit on 400 acres should be £1000. The introduction of tractor ploughing will be a great boon to the maize and wheat farmer in Kenya, but at present the high cost of fuel is an obstacle.

The third method takes longer for the farm to show a profit, but is more suited to a small capital. The undeveloped land is

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bought at perhaps £3 10s. an acre, one tenth cash down and balance over seven years. The farm is developed with fewer oxen and ploughs at the rate of 100 acres a year. Interest at 8% must be paid on the balance. By this method a nett profit is shown in the fifth year, and a capital of £2500 should suffice for 400 acres.

III. *Wheat.*

Lord Delamere has been the pioneer in wheat growing and had to overcome many setbacks before a wheat that suited the country was produced. With the help of the Agricultural Department various hybrid wheats are now obtainable that will produce good flour, and are highly resistant to rust, which was the chief cause of early failures. Wheat is still in its infancy and does not yet supply the whole of the local market; when greater production is reached there should be no difficulty in establishing an export trade.

At from 7000 to over 9000 ft. at Molo, Njoro, and Eldoret, wheat is now doing well. The yields reported from different districts vary to such a degree that it is difficult to state a fair average; probably about 28 to 30 bushels per acre would not be far wrong; some very high figures of small areas have been reported however; on my own farm at 9000 ft., as well as on that of a neighbour, the first crop on virgin land produced 12 bags per acre, or 40 bushels; this was taken from two experimental 10 acre plots, and the second years' crop should be better.

Wheat land can now be bought from £1 10s. to £3 an acre; it would appear that some of the high upland country at 8000 or 9000 ft., hitherto considered "grazing land" and valued at about £1 an acre, may prove to be the best wheat land of the future. Wheat may still be somewhat of a speculation as it has not yet reached the export stage, but provided the land is bought at a reasonable figure it offers probably the greatest chance of appreciation. More expenditure is required on machinery than for maize, and the crop is a more risky one, but the profits per acre should be considerably greater. Taking the same yield of 8 bags per acre, the bag of wheat now sells for 24/- as against 10/- for a bag of maize; export however will reduce the price to perhaps 18/-, and it must be remembered that land prices are rising rapidly in Kenya.

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IV. *Stock.*

Stock farming probably appeals more to those who love the wilds, the great open spaces, and shooting, than any other form of colonial life. Over all the large Nanyuki, Laikipia and Nivasha districts there are settlers building up large herds of cattle, but what their future is I cannot say. Some of these herds are bred up from the good native stock, but nowadays it generally pays best to buy grade heifers from other settlers, or in the market, at £7 to £10 each. The cattle improve most rapidly with each cross with an imported pedigree bull, or a good grade bull, both in yield of milk and in size and make. Cattle breeding can only be undertaken in the "clean" districts that are free from East Coast fever, and there they are generally inoculated for pleuro-pneumonia and rinderpest; it is certain death to them to enter any district where East Coast fever is endemic. So the troubles of the stock farmer are many. At present it is true there is always a sale for heifers to other settlers, and grade beef does not yet fill the local market; but this cannot last much longer. When the supply exceeds the demand of the local market it is hoped that there will be cold storage facilities on rail and at the coast, and an export trade will commence. But the quality of the cattle will have to improve considerably before Kenya can compete with the Argentine, etc. Dairying is still confined to the local market and is a very useful means of paying farm labour bills. In several districts farmers are combining and starting co-operative butter and cheese factories, and an export trade appears well within reach.

V. *Sheep.*

Sheep have recently come into much prominence in Kenya, and grade ewes have doubled in price. Those pioneer settlers who have gradually built up large herds of Merino, Romney Marsh, or Merino Romney sheep, reaped a great harvest during last year's boom in wool prices, and can sell all the ewes they like to younger settlers at very profitable prices varying from £2 to £2 10s. apiece. Sheep unquestionably have a great future in Kenya, but they are liable to a large number of diseases and ailments, and the prospective sheep farmer must certainly attach himself for several months to some big breeder before he starts on his own. That

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they do well and multiply exceedingly has now been proved; grazing and water are good and plentiful, costs of dipping and shearing and herding are very low, and the sale of wool is assured and easy. The beginner, unless he is an expert, will probably do best to start with, say, 100 native ewes at 15/- to 20/- each, and a few good young grade Merino or Merino-Romney rams at £4 each. With these he can buy his experience; imported pedigree Merino rams from Australia will cost him about £25 apiece landed on his farm, and had better not be bought till experience has been acquired. During his second year a purchase of, say, 400 grade Merino ewes at about £2 apiece, and, say, three imported pedigree rams, should complete the foundations of his flock. Allowing for selling all his wethers as they reach two or three years, his farm should begin to pay after three years, and in six years his flock should number about 3500.

The price of grazing land is now rising rapidly and has trebled in the last three years; much that was formerly considered "fair grazing land" and valued at from 5/- to 10/- an acre, is now found suitable in parts for maize or wheat, and the average price has risen to nearly 20/-. Again, there are many areas which, owing to insufficient rain or poor grass, can only be said to carry a sheep to 4 or 5 acres, and others owing to a certainty of grass all the year round will carry nearly 2 sheep per acre. Expert advice is very necessary when prospecting for a farm, and many settlers in possession of a 3000 acre farm in Nanyuki or parts of Laikipia are really dependent on 4000 or more acres of adjoining unoccupied farms; and they are not likely to advise the purchase of these farms!

The nett profit per sheep per annum is estimated by Mr. Long, Lord Delamere's experienced agent, as 7/-, allowing for sale of wool at an average price of 1/3 a lb., and wethers at 30/- each. Unceasing care is required in the management of sheep, but the work is interesting, and the life an ideal one in the wildest, most beautiful, and healthiest districts of Kenya. With an average birth rate of 85% and a death rate of 8%, it can be seen that with a very small beginning a large herd can be gradually built up. After purchase of land, for cash or on terms, if the settler has £1500 left and £150 a year for three years, he should reach the £1000 profit stage in five or six years; with less capital the beginning must be smaller and the years longer.

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VI. *Horses.*

There is one sad blot on the list of Kenya's attractions; that deadly scourge "horse-sickness" is terribly prevalent. Its cause, although the subject of years of research in South Africa, is still unknown. All that is proved is that at certain times of the year, especially during the rains, if a horse is out grazing, or tethered, after sunset or before 8 or 9 a.m., he is liable to be dead in 48 hours. Most people suspect the bite of some unknown nocturnal insect or mosquito, but nothing is proved, there is no antidote, and no inoculation. It is true that very high class thoroughbred horses have been bred in Kenya during the last ten years, but they have to be kept in stables and cared for in a manner that is out of place in a colonial life. The settler, whose horses must run at grass all day, be stabled in a grass hut by night, and be ready for a long trek entailing picketing out when required, must rest content with the Somali pony or mule, whose immunity is greater but far from being complete. Nevertheless good horses and ponies are being bred in Kenya, there are regular race meetings in Nairobi and Nakuru and Nanyuki, and polo is increasing wherever new areas are becoming settled. The horse-sickness seasons and areas, which are very local, are becoming known, and if horses are never allowed at grass between 5 p.m. and 9 a.m., have their temperatures constantly taken during the rains, and are not picketed out when on trek except during the very dry seasons, they have a good chance of survival.

VII. *Climate.*

The climate is perhaps one of Kenya's greatest assets; naturally it varies very markedly, as the "Highland area" of European settlement varies from 4000 to 9000 ft. above sea level. At 6000 ft. and upwards it is ideal, with no extremes of heat or cold, a day of 12 working, walking, or riding hours, sensible clothes, and a sun helmet or double Terai.

There are generally two rainy seasons in the year, but the months vary in different districts; in the Nairobi district the rainy seasons are six weeks in April and May, and three weeks in November, but they are not like Indian rains, and nearly every day has a bright and sunny morning or afternoon. There is seldom a month without a few days' rain.

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The air of Kenya is something unique, especially high up; it is invigorating and sustaining to a degree; after 12 hours' hard work in the open air one does not realise that one is tired till one sits down for ten minutes before bath and dinner, and the nights are completely refreshing. Personally, I built my house on an uninhabited mountain, between primeval forest and rolling downs, nearly 9000 ft. above sea, and revelled in the air and climate; a slight white frost on clear nights at any time of year, an average maximum shade temperature of 65°, 12 miles from the Equator, and no tropical bugs or insects!

Kenya is a country in the making, with advantages in fertility of soil, in climate, in rivers and forests and grassy downs, and to a limited extent in labour, that are entirely unique. She is hampered by lack of money, by ignorance and interference from home, and by her struggle to gain markets in a world still broken by the war; but she is going to succeed, for she does not beg, and takes no dole or subsidy. Her future lies in the joint progress of, and development of the country's great resources by her British colonists and native races. Neither can succeed without the other. She has attracted, naturally, some undesirables from both England and South Africa, but the good element largely preponderates, and includes many of the best that England can produce.

VIII. *Our own experiences in settling in the wilds.*

My wife and I spent our first nine months in Kenya breaking in a young coffee farm near Forthall, but the "call of the wild" and dreams of forest and mountain were ever with us, and determined us to tour the country in search of a better land. After interesting and adventurous journeyings, in which our Overland car carried us most nobly over apalling tracks with our camp kit, servant, and petrol, we found our ideal: perfect climate, lovely scenery, timber, good grazing and water.

In due course we acquired the land we wanted, put a manager in charge of our promising coffee farm, and trekked off with all our possessions, car, bullock carts, ponies and tents. En route we bought some more hens, a few cows and baggage donkeys, and shot some "Tommies" and a Grant Gazelle for the larder; so we arrived well stocked for two or three weeks. The steep sides of our uninhabited mountain were a serious obstacle, and our car

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had to remain below for several months; we managed to get our carts up by an old elephant track, after packing most of their contents on the donkeys. Between my partner, W., and ourselves, we had about 20 savages, besides more civilised house servants, and we were well equipped with carpentering tools, axes, picks, digging and clearing tools.

Our first week or so was occupied in making a temporary encampment of grass huts for our natives and our ponies, and bomas for the cows and oxen, while we explored the land to find the best house sites. We were nearly 9000 feet above sea level, the weather in January was glorious, and the air like champagne; a slight white frost at night, and sun all day, but never too hot. The site we finally selected for our house lay on the edge of a wood of fine old trees detached from the main forest by a stretch of park-like grass dotted with clumps of cedar and olive. Our partner, W., commenced building half a mile below us on the banks of a wooded stream. To the north of us lay miles of rolling downs, wonderful grazing, cut through by clear mountain streams and wooded ravines. In the distance the downs sloped gently, through more wild forest belts, to the plains stretching away to the borders of Abyssinia. To the south, looking over our future garden, the vast primeval cedar forest with all its unexplored depths untrodden by the foot of man, gradually climbed the mountain slopes towards rocky peaks 12,000 feet high.

It was in this wildly beautiful country that we lived and worked from dawn to dark for 18 months, building our house of cedar poles and home-made bricks, and lining it with hand-hewn, planed and polished cedar panels. Stables, kitchen, cowsheds, stores, and dairy, all slowly grew, and garden and paddocks were fenced with cedar and bamboo. It was hard work with only 12 raw savages to help one! but I can imagine nothing more fascinating than developing one's home in the wilds of Africa, watching the work of one's hands and head take shape, and gradually surpass one's dreams! Meanwhile W. and I experimented with our farming and picked up all the knowledge we could; we had to find out what was best suited to our climate and altitude, and finally decided on sheep as our first objective, and, after some successful experiments, wheat as our second string.

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My wife's dairy was soon a success, and, with the purchase of some more grade heifers, was sending 50 lbs. of butter to the Nairobi market every week.

I cannot omit a mention of our garden, which was perhaps the most successful of our efforts; it was made by my wife with the aid of any odd natives that could be spared. Can you picture to yourself a stretch of brilliant English lawn, beds and borders a blaze of English flowers, roses, hollyhocks and sweet-peas, dahlias, antirrhinum and larkspur, growing in masses nearly twice their English size, and in blossom nearly all the year round? That is easy, but set this picture in the vivid contrast of one of the wildest spots in Africa, dot it with a few old giant trees, some bright flowering local shrubs, a few young cedars and old olives; give it a background of solemn prehistoric forest, and a foreground of rich undulating grass sloping down to a rushing stream, and you may form some idea of the peculiar charm of our Kenya homestead.

The prospective settler must not cherish any delusions that he will spend half his time in shooting. He will soon find that if he wishes to make good, and cut down overhead expenses, he will have to work so hard that he will have no time for shooting expeditions to the great plains where large herds of game rejoice the globe trotter, and the game that has consented to remain about his farm is almost preserved for the larder. Nevertheless he will not do badly. Shooting for "the pot" is poor sport, but it cannot be avoided when one is living in "the blue"; during the 18 months in which we lived on the rifle, and never saw a butcher's joint, I did manage to collect some good heads, and I have recollections of many delightful Sundays when we rode over the downs to the banks of some deep ravine where a clear mountain stream emerged from the forest. There, as we sat with glasses searching the opposite slopes, a gleam of gold would reveal a doe bushbuck nibbling some shrubs, or the sudden move of a pair of horns would show us the old buck in his shining chocolate coat, cautiously approaching a favourite pool. Further off in the denser forest, where pale green bamboos could be distinguished among cedars grey with hanging lichen, an occasional crackling would tell us that the elephant herd had returned, and perhaps the shrill squeal of a youngster would confirm our suspicions.

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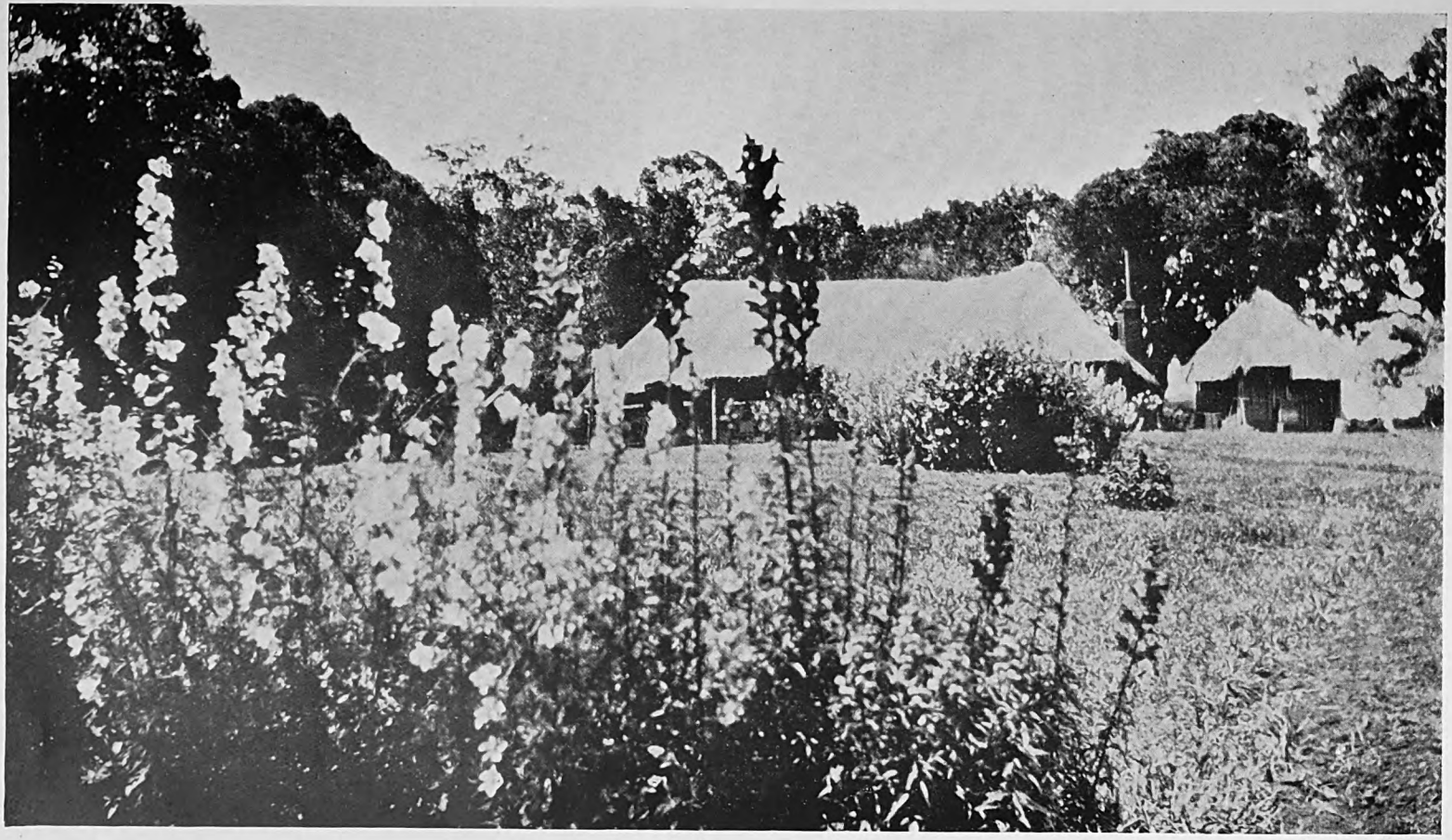

"Our Kenya Garden."

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As we rode home in the evening, with two brawny Kavirondos carrying a fat buck slung to a pole, we could see in the valley below our cows being driven in to their night paddock, and perhaps on the next ridge a herd of sleek zebra attracted by the young grass on a recently burned fire line.

Other days, when work permitted, we would explore the depths of the untrodden forest that commenced close behind our garden. I cannot describe the forest—it was fascinating to a degree, yet almost terrorising—full of the still grandeur of its primeval cedars, dead, dying and in their prime; traversed by innumerable animal tracks, the broad clean path of the elephant along which we rode, or walked with rifle ready, tracks everywhere of animals known and perhaps unknown, that could be sensed, not seen; but never a human footprint. Great impenetrable stretches, where some storm or unknown force of bygone ages had felled an inextricable mass of giant trees, were succeeded by long vistas through the straight cedar trunks; here the sun shone through and lit up a bright red bushbuck staring at his first human being, or it might be the huge shaggy head of a buffalo, bent low, listening to an unknown step. Further on the forest opened out for a space, giant Kenya heather, five feet high, replaced the cedars, and we found ourselves treading on the fresh tracks of a rhino whose great black bulk might at any moment dispute our intrusion.

The whole atmosphere was indescribable, something more grand, more solemn, and yet more perfectly fascinating than anything I have met; it reminded me in a way of my first impression of the interior of Westminster Abbey, and one found it impossible to speak beyond a whisper.

I may have painted the charms of Kenya too brightly; it has drawbacks as well as assets; but I must confess I fell a victim to its charm, and I met no man and few women there who did not do likewise. Some few, it is true, abuse the country, but they go back there, drawn irresistibly by a new young colony in the making. In case I may be accused of luring promising officers from the army, I must conclude by admitting that, much as I loved the life and country, my happiest day was when I heard there was a place in the regiment for me again; but it is to Kenya that I shall return when I am no longer wanted.

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A MONTH'S SHOOTING IN THE C.P.

COMMUNICATED BY BT. LT.-COL. W. R. REID, D.S.O., R.A.

The following account, written by Lieut. N. V. Watson, 21st Field Battery, R.A., of a month's shooting in the Central Provinces, may be of interest to officers who are expecting to be sent to India in the near future. In addition to the four tigers mentioned in this account, five others as well as a bison and three panthers have been shot by subalterns of this Brigade who took their leave in the Central Provinces during the present hot weather. Mhow, C.I. 28.7.25.

TO be successful a big game shooting trip requires careful organisation, for it is surprising how much time the preparations take when there is one's ordinary work to do; and, when one is going to be miles away from anywhere, this careful personal preliminary attention to details repays a hundredfold. Darley and Watson, two subalterns of the 27th Field Brigade at Mhow arranged, at about Christmas time, to go for a month's shoot during March and April, and immediately applied for blocks. They got their permits in due course, and started on their shoot on March 19th.

The two officers met at H . . . . station on March 19th and cycled on ahead of their baggage to R . . . , the headquarters of the Range Officer. This official did not come back from the jungle until 8 p.m., when he came across to see them at their camp. He was very helpful indeed, and had managed to get them three "bodas" (buffalo calves) for tying up.

On March 20th a start was made for the forest bungalow in the block where Darley and Watson intended to make their first stay. The evening was spent in making friends with the local population and arranging for a shikari. From March 21st to 26th was spent in reconnaissance, etc., but no kill occurred until March 27th.

March 28th. As this kill was at a place where it had been arranged to sit up and not to beat, a machan was made during the morning, the material for which was cut and brought to the spot

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from a distance, and every care taken to be as quiet as possible. Eagerness to *see* a tiger at least, induced both Darley and Watson to sit up together that night, and they were in the machan at 4.30 p.m. The kill had to be moved some five yards or so to get a clear view. There followed a most disappointing vigil. At about 9 p.m. one or two low growls were heard at the spot where the kill had been; then there was complete silence for some time, followed by the full-throated roar of an angry tiger from a hill to the right. This roaring went on at intervals for half an hour or so and then ceased, and nothing more occurred that night, nor during the following night, when they again sat up in the same place.

March 31st. Making up their minds to try the other side of the block, Darley and Watson set out at dawn on bicycles, taking a map with them on which, however, being a rather old edition, the tracks were shown inaccurately. After cycling for an hour they realised that they had struck a different nullah to the one they had originally intended to go down, but, as it would have taken some time to set themselves right, they continued down this nullah, finding plentiful signs of sambar, and seeing some does. On reaching the village of R . . . . it was found deserted, as the villagers were all out cutting wood, so they returned to G . . . .

That evening Darley went to a place where he had seen a sambar the two previous evenings, and this time he came upon it at the edge of some bamboo jungle, and was able to get a kneeling shot at about 50 yards. The first shot knocked it silly and it blundered straight towards him when he was able to give it the *coup-de-grace*. The horns measured 41 and 40 inches respectively and it was a fine regular head.

April 1st. Another reconnaissance was done on bicycles, and this time the two got down into the valley they had intended to reconnoitre the day before. They had scarcely got to the bottom of the nullah when fresh pug marks of two tigers which had gone along and returned by the same track were seen. About three miles down the valley a couple of four-horned antelopes were met and Darley shot one, which provided the camp with most excellent meat for some days. Going on the village of B . . . . was reached, and the "Makaddam" (headman) and local forest guard were interviewed.

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It was decided to move camp next day to a spot near this village.

April 2nd. After some difficulty in getting carts, camp was moved to B . . . . in the morning. The sportsmen decided to adopt the practice of sitting up over live kills, at any rate for some time, as owing to the large numbers of small nullahs and thick jungle, it was thought that it would be impossible to beat here. Also they were anxious to see a tiger killing if possible. Accordingly two machans were erected soon after camp was made, and sitting up was commenced that night. Nothing happened during the nights of the 2nd, 3rd or 4th, but it was most interesting as there was a good moon which gave ample opportunity for observing the life of the jungle, and much was learnt regarding the various calls and habits of its denizens.

April 5th. There was a good moon for the first part of the night and, at about 9 p.m., the "boda" under Darley's machan was attacked by a tigress, which at the time was thought to be a large cub. So quick was she that Darley's first view of her was when she had withdrawn a few yards, after attacking, and was sitting in the grass, watching the buffalo struggling on the ground. Deciding to shoot, Darley switched on his electric torch as he could not see his sights in the shadow of the tree. To his annoyance the torch had got out of alignment (he was not using a proper clip and merely had his torch tied to his rifle with string), so he took a shot at the tigress without the aid of the light. The tigress disappeared in complete silence, which gave Darley the impression that he had missed, nevertheless he stayed in the machan the rest of the night in case another should come, but nothing else did.

Watson who was in another machan a few miles away was dozing lightly when, at 4 a.m., he was awakened by the sound of his buffalo being killed. The moon had set, and it was absolutely dark. Getting into the firing position slowly and quietly he waited a short while in order to let the tiger settle down, and, when he had judged that he had waited long enough—about two minutes—he switched on his torch, but saw nothing but the dying buffalo in the small circle of light thrown by the torch. For an awful moment he thought somehow the tiger had been scared away, and he had visions of accusing faces in the morning, whose owners

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would be sure that he had slept when the opportunity came. However, he kept the circle of light on the buffalo for fear that switching off and on might cause more suspicion, and, after about fifteen seconds' anxious waiting, a tiger boldly walked into the circle of light, siezed the buffalo by the buttocks, and attempted to drag it away. The buffalo was picketed to a post driven into the ground, and, while Watson was waiting for a more favourable shot, it seemed likely that the tiger would uproot the post, so a shot had to be taken while the tiger was jerking at the kill. Upon this the tiger spun round and round growling and obviously hit fairly well—but not fatally, and a second barrel, fired into him as he was spinning, caused him to rush off into the jungle, where he could be heard crashing about in the bushes a short distance away for a long time, gradually drawing further and further away. Some ten minutes later, while this tiger was still crashing about faintly, perhaps fifty or sixty yards away, sounds as of eating were heard from the direction of the kill. The torch was again brought into action, and this time it revealed two more tigers on the kill, one squatting near the buttocks and eating away merrily, the other moving round trying to find a choice portion on which to begin his meal. Neither tiger seemed to mind the light in the least, and, as the one which was moving round the kill seemed to be the bigger of the two, Watson waited for him to stand still for a second. While this was going on, the wounded tiger made a slightly more vigorous flop, which, attracting the attention of the tiger which had not yet started his meal, caused him to dart off to investigate without giving a shot; leaving, however, the other one still eating unconcernedly. Further additions to the investigating party could not be allowed, so a shot was taken and our friend died without moving an inch. Now Watson argued that there was a chance that the third tiger might possibly return, and also that, should he do so, he would not stay long once he had seen his dead friend, He did indeed come back in about a minute's time, and a quick shot caused him to rush forward some twenty yards and fall dead with a bullet in his heart.

Daylight came, and with it the men, who were surprised to see two dead tigers, and who seemed incredulous that there was yet another to be followed up. The tigers were covered up with leaves to protect them from the sun, and Watson decided to go

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back to camp, have breakfast, and replenish ammunition before following up the wounded tiger, as a short reconnaissance showed that it had gone some distance, and the following up was likely to be a long job.

Darley, having looked round his machan for about one hundred and fifty yards for any trace of blood, and failing to find any, returned to camp certain that he had missed, and, after breakfasting both sportsmen went to look for the wounded tiger. Taking a couple of men with them to climb trees they commenced by looking for the blood trail, which was found some seventy yards from the place where the tiger had been hit. The trail was followed up a steep slope, and across a small plateau covered with long grass. Both on the slope, which was covered with bamboo clumps, and when going through the grass, it was necessary to send men up trees to look ahead, but it was with the greatest difficulty that the "Korkus" could be persuaded to climb, and when they did do so, they did not go very high, declaring that to climb higher was impossible. This laziness was sorely trying at a time like this! Having crossed the grass plateau, the trail led down a steep slope into a smaller valley, and the party had scarcely descended a few yards when growls were heard from the bottom of the nullah. At the first growl a demonstration of rapid tree-climbing was carried out by the two "Korkus" who had found it so difficult to climb before; but who could blame them now? The tiger was approached slowly and cautiously, and it was some time before he could eventually be seen. Darley saw him first and had a shot and it took yet another shot to finish him off. The first two shots had entered the shoulder and loin respectively, breaking both legs on the near side. How this tiger managed to go so far shows their amazing vitality. The three tigers were not got into camp till noon, and the tent was cleared out and skinning begun. A skinner could not be procured locally, so the two gunners had to do it themselves. It proved a terrible task, especially as there was no possibility of resting until all three were done It was 4 a.m. by the time the skins had been removed and put into a pickle of salt and alum. There still remained several hours' work to do on lips, claws and ears.

April 7th. The day was spent in working on the skins, and, in the evening, Darley went to sit up in a machan near the place

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where he had shot at his tiger. On the way there he was attracted off the path by a smell, and came upon his tigress—dead! It was fully two hundred yards from the machan, and had been hit straight through the shoulder. Having been dead for forty-eight hours the maggots had got at it, and it was in a dreadful condition. However it was brought back to camp and a lotion of carbolic was poured over the skin. The business of skinning this putrid tiger, in addition to the other work still to be done on the others, decided them to send in to M . . . . for a "Chamar." Accordingly a man from the village was induced, by promise of much reward, to make the journey by moonlight, accompanied by the orderly and the cook of the expedition, both of whom stoutly volunteered to go. The party had only been away ten minutes when shouts were heard in the distance, and, shortly afterwards, they returned in disorder. They had seen a tiger cross the road, and the villager had refused to go any further.

April 8th. The "Chamar" was sent for in the morning and arrived about 2 p.m. The day was spent working on the skins. Darley again sat up, but, although a tiger was about, it did not come up to his machan.

April 9th. Darley descended from his perch at dawn, and seeing tiger tracks on the road, followed them up. He had gone some four hundred yards up the nullah when a tiger growled at him from the slope on one side. Darley went after it, climbed the hill, and came to the usual grass plateau on top. There stood the tiger not fifty yards away in the grass—facing him. He waited for it to turn away, but it showed no disposition to do so, and eventually sat down in the grass, with only its head showing, presenting an even more difficult and dangerous target! There was a small teak tree a few yards away and Darley edged towards this, but while he was in an awkward position, trying to get a better view from a low branch, the tiger suddenly made off with such speed that Darley missed the opportunity of a shot, and returned to camp very disappointed.

April 11th. Darley got a telegram recalling him from leave and ordering him to join at Fort Sandeman by the 27th. This meant that he would have to go as soon as possible, so parties were

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sent out to get carts, which were very scarce at that time owing to logging operations.

April 12th. After sitting up for the last two nights without having any luck, Darley went to have a look at the place where he had met the tiger and came across fresh bison droppings, and presently came upon four bison lying down in the grass, only fifteen yards away from him. As they were lying down he was unable to be certain which was the bull, so had to wait for them to move off, which they eventually did, enabling him to kill a fine bull.

April 13th. A cart was at last procured and Darley left that evening, leaving Watson to finish the cleaning of the bison mask, etc. Watson returned to H . . . . station on April 15th.

The whole trip including railway fares, etc., worked out at Rs400 each, which is not an excessive figure. The expenses would, of course, have been greater if there had been beats.

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A COUNCIL OF WAR NEAR TIZI OUZLI.

General Gillman, Maréchal Pétain, Generals Naulin, Simon, Boichut, and George.

[*See p. 183.*

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"DUNCAN" SILVER MEDAL ESSAY, 1925-26.

In a future war on a large scale expansion will be through the Territorial Army.—Discuss the organisation and training of the Artillery, Regular and Territorial, to meet the requirements of such a system.

One Army not two.

By Major S. R. Wason, M.C., R.A.

" . . . . *nos et mutamur in illis.*"

Expeditionary Forces.

IN 1923 the House of Commons took exceptional interest in the Army Estimates, and on the question of the size of the Expeditionary Force the civilian element did not hesitate to take the Government to task for the apparently small return for a large expenditure. For fifty-two millions only one division could be mobilised immediately, and four months were required to put four divisions and a cavalry division into the field. This year with the estimates reduced by nearly ten millions as compared with 1923, a similar force can be mobilised in a far shorter time. But its reserves are quite inadequate to make good the wastage of modern war for any reasonable period, and there is apparently no question of re-forming the Militia or Special Reserve. Finally, in order to avoid reduction of personnel, all other votes have been cut to the bone, and there is general anxiety at the curtailment of orders for stores and ammunition, and especially of the mechanicalisation programme. An increase in the Royal Air force vote, a little more of the Locarno spirit, or further trade depression may reduce the Army vote, and what happens then?

In the debate on the Economy Bill the Chancellor of the Exchequer laid stress on the fact that the British Army had never been measured against the menace of Continental war. The history of the Expeditionary Force proves that this is true. The Expeditionary Force has always merely consisted of such troops as had

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to be kept in this country to maintain the Cardwell system. The organisation of this force has been evolved by soldiers, and with certain notable exceptions, in spite of the politician. In 1882 when there were 40,000 men in Egypt Mr. Gladstone told the House: "there was no war, but only military operations." To fit out a battery to send with this army, two others had to be destroyed. In spite of Lord Wolseley's efforts, the South African War found things little better, and formations, commanders and staffs had to be improvised. Later the so-called "Striking Force" had to be renamed the "Expeditionary Force" in deference to the susceptibilities of the voters. In 1914 there was no higher organisation than the division, and there were no plans for expansion.

EXPANSION.

But since the war the situation has changed—in theory. The Minister introducing the 1923 Estimates spoke of the Territorial Army as having become "the real second line of Imperial Defence," and his words were echoed by an Ex-Secretary of State for War. Field-Marshal Sir Henry Wilson had written a memorandum on the change of basis of organisation of the British Army from small wars to great wars. Pledges were given to the Territorial Army that their units would be kept intact and that their men would not be used as drafts for the Regular Army. There has been much talk of the Territorial Army as the basis of expansion of national armies in war. But it is all theory and conjecture. No practical steps have been taken. In the debate on this year's estimates a distinguished soldier said that "ever since the war the opportunity of bringing the army and civilian population together has been missed," and that "the reduction of the Territorial Army vote is to be deplored as necessarily reducing the intercourse between the Regular and Territorial Armies." He was not answered.

These armies fought side by side in the last war. But the "immediate demobilisation" electioneering cry of popular journalism destroyed the British Army of that war. Committees assembled and discussed every aspect of military organisation. A wit said of their members that "individually they had no power to decide anything, but that collectively they had full power to decide that nothing need be done." In few cases was effect given to their

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reports. First of all every unit, Regular and Territorial, had to be remade, and the opportunity for bringing these armies together was lost.

But for the growth of a considerable non-divisional artillery the Territorial Artillery is organised as before the war. In spite of the greatly increased responsibility of the Territorial Army, its artillery is trained as before the war. In spite of the inevitable amalgamation of Territorial and Regular Artillery on the outbreak of war which the use of the Territorial Army as the basis of expansion entails, there is little more co-operation between the Territorial and Regular Artillery than before the war.

Artillery is only part of an army, and the organisation and training of a part cannot be considered apart from the organisation and training of the whole. Before considering this question, however, it would be as well to look at the purposes for which the army is maintained.

The needs of this country are diverse. We must have a nursery for our overseas army, we must have an Expeditionary Force available without resorting to national mobilisation, and we must have an organisation on which to form a national army. We must be prepared for small wars, for the so-called Near-Eastern type of war, of which the main feature is their liability to spread into European war, and for war on a national scale. In such we might be neutral for a period, or our contribution at first might be limited to our Navy and our Air Force. The army must be organised to deal with all these eventualities.

Without entering deeply into the possibilities of war on a large scale attention must be drawn to some of the factors that directly affect the expansion of the British Army. The internal combustion engine will continue to alter the methods of war. The most certain result of mechanicalisation will be very rapid action on the outbreak of war. This will place this country at a still greater disadvantage than before. The units of the Expeditionary Force will hardly mobilise their required thousands of mechanical transport vehicles quicker than in 1914, and the transportation of these vehicles presents most serious problems in the way of suitable ships, special embarkation and disembarkation gear and special wharfs. It would seem that a British Expeditionary

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Force will have even less chance than before of taking part in the opening stage of the campaign.

The special problem under consideration is the formation of a national army on the basis of the Territorial Army, and this is certainly a matter of months. Probable enemies are most unlikely to allow any such measures to be taken before a declaration of war. The susceptibilities of potential enemies were keenly enough stirred by the mobilisation of their neighbours in 1914, and the presence of well-equipped fleets of armoured cars will not tend to allay this form of nervousness. It may be assumed that even a period of preparation such as would permit of the embodiment and training of the Territorial Army is most unlikely. Then we cannot count on any time for preparation before the outbreak of war unless this country could remain neutral for a time; this appears to be a remote contingency.

Now other nations may keep smaller standing armies, but that does not prevent them perfecting their organisation to bring their main forces into the field in the shortest possible time. As far as the effect of mechanicalisation can be foretold, the most unlikely thing to happen is a stabilisation of the war on long extended fronts, and it was this that caused the last war to go on for over four years.

If this country then is to pull her weight in an alliance, and it must be hoped that continental war without allies is most unlikely, she must be ready to make every effort to quicken the speed at which she can put her national army into the field.

An army consists of two parts, its body and its soul. Its units and its formations are its body, its *esprit de corps* is its soul. One is of no use without the other, but while the body may be a matter of quick growth, *esprit de corps* is an attribute that can be neither bought nor improvised. Regimental tradition has imbued the Regular Army with that spirit which counts more to an army than weapons or numbers when the pinch comes. It may be that even for infantry and cavalry, regimental tradition by itself is no longer the best foundation for *esprit de corps*. It has the disadvantage that it cannot be shared to a great degree by Territorial units, much less by the units of a national army. It may be well to support this statement. The Highland Regiments are second to none in pride of tradition. Yet one of their officers writes that the rank

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and file of the Highland Territorial Division felt that they belonged to the 51st Division first, and to the Seaforths, Black Watch or whatever it might be, second.

The introduction of new weapons and new tactical methods will bring about repeated reorganisations, the abandonment of ancient regiments, tradition and all, and the raising of new units which will have to do without this valuable aid and seek inspiration for their *esprit de corps* elsewhere. Conditions of service in the Artillery have hindered the growth of unit tradition and the tradition of the regiment, especially since the amalgamation of its branches, is too indefinite and intangible for the private soldier in peace or war. There are other arms which are similarly placed. Territorial tradition on the other hand can be shared by all, is independent of reorganisation and of reduction or increase of numbers. There seems no reason why Territorial tradition and Regimental tradition should not exist side by side if the Territorial and Regular armies are brought together. Here, then, is the basis for the *esprit de corps* of a "New Army," and especially of its artillery.

Two Alternatives.

There appear to be two alternative systems of expansion. The first is to retain the Regular Army as it stands as an integral part of any "large war" organisation as in the late war, and while improving conditions as much as possible, to leave the Territorial Army on mobilisation to expand and train itself. The second is to have one army, not two, and to regard the Regular Army's part in the national war as two-fold—first to provide an Expeditionary Force if required, and secondly to provide instructors and a stiffening for the Territorial Army.

The objection to the first method is its wastefulness. In 1914 almost all the Regular officers in the country found their way abroad and were overwhelmed in the chaos of the first few months. Expansion was thus delayed, and efficiency jeopardised. It has been officially stated that this would not be repeated, and that educational establishments, for example, would be retained. But without further help it is not clear how the units of the second and third divisions of the Territorial Army could be formed with any

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less delay and confusion than the units of the New Armies in the last war.

The chief advantage that is claimed for the second alternative is that it would reduce to a half the time that would be required to put a national army into the field, and at the same time increase its efficiency. At present the time required for tank production after mobilisation is the weakest link in the chain; the Territorial divisions would have to wait for them. But evolution of mechanicalisation in civilian life will probably go far to remove this difficulty which is just as great for our possible adversaries as for ourselves. The number of commanders and staff officers required by twenty-eight divisions is approximately fifteen hundred. Coming to the artillery the number of battery and brigade commanders required would be about seven hundred for a force of twenty-eight divisions, and half as many again for forty-two divisions. The total number of Regular artillery officers on the active list and regimentally employed is about fifteen hundred, and almost half of these are abroad and would not be available. It is not suggested that all staff officers or all senior artillery officers must be Regulars; but to reach efficiency quickly the proportion would have to be considerable. The Reserve of Officers would of course help a great deal, but even so it is clear that the provision of the senior officers necessary for the smooth and rapid expansion and training of these armies would be a great difficulty if the Regular Army went abroad taking with it all its regimental officers, and with casualties draining what small reserves were available.

The next advantage is that if the principle is admitted the whole military organisation would acquire an elasticity which the rigid division of Regular and Territorial armies forbids. For example, if an Expeditionary Force of two divisions were sent overseas a proportion of all personnel would be left behind to act as a nucleus in case of expansion, and this proportion would depend on the international situation. Again, if there was a fear of invasion the Regular formations would send a proportion to reinforce the first line Territorial divisions, and would be completed with reservists and held until after a month or so the first line Territorial divisions were ready to take their place. The Regular units would then be diluted and the available personnel used together with a nucleus

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from the first line Territorial divisions to form the second and third line divisions.

It may be said that this is the sacrifice of the Regular Army. Yet looked on from the larger point of view the system advocated enables the Regular Army to reach its highest point of usefulness. The amalgamation of the Regular and Territorial artilleries on expansion would eventually result in the present pledges made to the Territorial Army being broken. But the latter would surely exchange their present guarantees for the fuller recognition which this system would give. The admission of the principle would bring the Regular and Territorial armies together and, though it might take some years to change the outlook of the Regular Army, in the end this system would produce an organisation which could be expanded reasonably, quickly and efficiently. It has the advantage that it entails no disorganising reorganisations, and that its application could be quite gradual. The arguments in favour of this system have been considered fully, because its details in general are particularly applicable to the artillery, and because without some idea of the probable organisation of the army as a whole, a satisfactory organisation for its artillery could not be suggested.

ORGANISATION.

EXPANSION IN 1914-15.

There is very little official information on the method of expansion in the beginning of the last war, and that from private sources, though interesting, usually misses the point. The successes and failures of the method then used should show many pitfalls which the change of basis of expansion will not in itself avoid. The following facts are probably typical of many New Army brigades.

The batteries of one of the New Army divisions were formed in September, 1914. Up to the beginning of the following January they were almost completely without Regular officers and non-commissioned officers. To give an illustration of the shortage of non-commissioned officers, the battery sergeant major of one battery was a gunner who had been left behind on mobilisation as store-

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man. His late Captain had classed him among his "broody hens"—those that never had laid (the gun) and never would lay; consequently he never qualified for proficiency pay and so could not be promoted. The quarter master sergeants were usually incapable, sometimes worse. The non-commissioned officers were usually those who had asked for the job. Equipment was desperately short and so was uniform. But what there was was wasted. In one battery, out of 16 saddles and bridles given by Lady Roberts' Fund, none were serviceable after two months. The men lost, wore out, or sold, on the average one pair of boots each per month, and an even larger number of blankets. There were four guns of an old pattern permanently in action on the barrack square, and each battery did one and a half hour's battery gun drill a day, the non-commissioned officers passing orders, and the men setting figures on improvised wooden dials without having an idea in either case what the orders or figures meant. The drivers went through interminable skeleton driving drill, riding bareback with halters, and then repeated the process in the afternoon on foot on the barrack square, without any idea what they were doing.

As a result of this soul destroying process the men lost their keenness and their discipline. A steady proportion of two-thirds overstayed their Christmas leave. Lack of equipment was responsible for much, but the more gear they had the more they lost. Those first three months' training did more harm than good. There were simply not enough officers and non-commissioned officers to go round who had an idea of organisation, administration and training. There would have been no more if expansion had been on a Territorial instead of on a New Army basis. Decentralisation and the utilisation of the county associations would have improved the machinery for expansion, but would not have added a single suitable brigade commander. The first line Territorial brigades and batteries will have very few experienced officers to spare to organise the second and third lines, and much help from the Regular Army will be absolutely necessary. At the present time the Reserve of Officers would fill the gaps so made in the Regular units, and many volunteers of experience would also be available. But an eventual increase in the Regular establishment may become necessary.

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COMMAND ARTILLERIES.

It is necessary then to make sure that every Regular officer and non-commissioned officer is brought to look upon his probable duties should this emergency ever arise again. He must be prepared to fill the next senior rank to that he holds, and to carry out his duties in that rank without much help from above or below. He must understand the classes which he may some day have to make into officers, non-commissioned officers and men, and realise the differences between them and the material of the Regular Army. Especially must he understand administration, for if it is true that administration is the basis of tactical efficiency in an army, it is doubly so in a unit. The officer joining the Reserve of Officers particularly must realise all these things, for on expansion much will depend on him.

It is difficult to see how this can be done when there is a Regular artillery and a Territorial artillery, very far apart and with nothing to bring them together.

The formation of Command Artillery Regiments, or battalions of the Regiment, is suggested as a means of bringing the Regular and Territorial Artilleries together and of providing an organisation for expansion. Territorialisation by divisions would be preferable but the foreign roster and the promotions of officers seem insuperable difficulties. It might be possible to effect the same purpose by affiliating each regular unit to an individual Territorial divisional artillery of its own command artillery. The advantages claimed for territorialisation by commands will be enumerated.

The first advantage is obviously that the Regular artillery will get to know the Territorial artillery and its problems in peace time. The differences between these two appeal immediately to all regular officers becoming Territorial adjutants; they usually take some time to get accustomed to the new atmosphere and to change their outlook. But change their outlook they all do, and many of them become more "Territorial" than the Territorials themselves. There is no time for this on mobilisation. The Territorial artillery on the other hand would benefit by getting to know the Regular artillery; at present they chiefly recognise the Regulars as the source of most of their difficulties, and in this they are often led by their Regular adjutants!

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The second point is that the decentralisation so effected would be invaluable on mobilisation. It is hard to see how a Regular organisation administered by the Adjutant General's branch at the War Office, and a Territorial organisation administered by Commands could possibly function in war when it came to exchanges of personnel, and that means from the very beginning.

The third point is that until it is brought before them more clearly Regular officers and non-commissioned officers will never see their liability as instructors, especially in administration. Yet under any system, whether expansion or not, these are among their most important duties in war.

The fourth point concerns the Regular only. The Royal Regiment is too large. Its officers now move too much, and individuals are associated with each other too little. It will be exceptional for two officers ever to serve together twice unless it happens that they both specialise in the same branch. Efficiency and regimental life both suffer. With far more frequent changes of officers, and continual re-organisation of units, "esprit de unit" will be a very transient help, and it will not be easy to keep up the standard of batteries. Territorialise them, and they will have a basis for tradition that will survive all these changes. Group the officers into command artilleries and regimental life will improve because the same officers will tend to serve together. Efficiency will increase because senior officers will get more opportunities for gauging the abilities of their juniors, and junior officers will come to know and understand their seniors.

The first step towards bringing such a scheme into operation is to allot all units of Regular artillery to Commands. This allotment cannot be otherwise than purely arbitrary. It would have no reference whatever to the present organisation of regular divisions nor would command within regular divisions be affected at any time. The allotment would have to be made with reference to the foreign roster with the object of ensuring that as far ahead as can be foreseen part of each command artillery of each nature should be serving at home and part abroad. The amount of artillery allotted to each command should depend on the amount of Territorial artillery at present raised in the command, or, if the scheme were to be carried still further, on the amount of artillery to be

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raised in each command on expansion. In cases it would be advisable and probably necessary to allot single batteries to commands.

The next step is to fix a date from which the officers' list would be divided, and this should be placed six years ahead of the date of the inception of the scheme. Every facility should be given to officers to transfer to the command artillery of that part of the country to which they belong. Such transfers should take place normally on change of station by the unit, or of category or unit by the individual officer in order to avoid unnecessary movement. Officers on first commission would elect to the artillery of which command they would be posted. As far as the exigencies of the service permit non-commissioned officers of or above the rank of sergeant should be transferred in the same way and at the same times as officers. Rank and file turn over so quickly that if recruits were posted to command artilleries according to their place of enlistment in six years the Scottish Command Artillery, for example, would be Scottish in fact as well as in name.

Command Depots.

The first object of a system of expansion on a "Territorial" as opposed to a "New Army" basis is to build the national army on a foundation already in existence.

The Depot at Woolwich has been of great value to the Regiment. It has raised the standard of the recruit as he joins his unit to a degree hitherto unknown. Through the number of junior officers and non-commissioned officers which pass through it the Depot has opened up possibilities of smartness of turn-out and drill which are gradually leavening all units of the regiment. It has materially assisted in the amalgamation of the regiment by bringing large numbers of officers of both branches of the regiment together on common ground. But it is unsuited to the needs of a depot for the regiment in war, even with a regular expeditionary force in a war on a small scale.

On the outbreak of a war on a large scale or on embodiment of the Territorial Army on a threat of war, recruits would pour in in huge numbers. Presumably there will be a national register and compulsory service will be applied and the flow of recruits con-

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trolled; large numbers will have to be dealt with. The units of the first line divisions of the Territorial Army would be fully occupied with the personnel to bring them up to war establishments, especially if they were to become six-gun batteries as is presumably the case. Apart from the rank and file recruits there would be large numbers of junior officers and cadets, and considerable numbers of senior officers from the Reserve of Officers to be absorbed. Depots or reserve units are required from the commencement and act as clearing houses for personnel.

A system of Royal Artillery depots in each command would certainly be less economical in time of peace than a single depot. But the artillery is already at a great disadvantage as compared with infantry or cavalry for opportunities to co-operate with the Territorial Army in peace by reason of its lack of a system of distributed depots. A depot in each command would do so much to bring the Regular and Territorial artillery together, to help with Territorial artillery training in peace and with the formation and training of new units on expansion, that such depots must inevitably form part of any scheme and the expense would have to be faced. They would deal without difficulty with the reservists and recruits required to maintain a Regular Expeditionary Force. By providing a clearing house for personnel, or expansion as before explained, they would prevent the over-loading of units fully occupied with their own training. Cadet batteries would be part of their organisation. Courses would be held at these depots to give both junior officers and non-commissioned officers a first training away from their units. Instructors' courses and specialists' courses, both difficult to organise in a newly-formed unit, would also be undertaken. These depots would carry out the functions of the Reserve Brigades of the last war. In war they would be Colonel Commandant's commands. Their organisation on expansion would be worked out beforehand in detail; it would be easy to find suitable prospective commanders among officers on half pay or in the Reserve of Officers, and they would be nominated in time of peace.

With the Regiment, Regular and Territorial, divided into command artilleries, the distinction between Regular and Territorial officers would vanish on mobilisation. All officers not on

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the strength of units in formations would pass through the units of their depot. The large number of junior officers required would be found from the Reserve of Officers, by promotions in the field, and by selection from the ranks of the Senior Officer Training Corps units. The Cadet units of the depots would be filled by cadets from the Senior Officers Training Corps, from the public schools and by nominees for commissions from the Territorial Army. Such a system would bring the cadet straight into the atmosphere of the arm in which he would receive a commission, and for the artillery, certainly, would be preferable in every way to the suggested scheme for forming cadet units at the Universities.

It must be repeated that the provision of senior officers to command batteries and brigades is the greatest difficulty of expansion. So far, however, as organisation is concerned the formation of command artilleries, and the amalgamation of the Regular and Territorial artilleries, should assist in that it would bring the problem directly before every officer going to the Reserve, and would also by the decentralisation effected simplify the utilisation of available resources in experienced officers. In passing it may be remarked that the threatened blocks in officer promotion may soon necessitate measures to invite an increasing number of retirements of officers of ten to fifteen years' service, and any such measures would be very valuable in building up the reserve required.

Any form of periodical training of reserve officers would greatly assist in solving this most important problem.

The effect of Mechanicalised Warfare on the Organisation of Artillery.

The Chief of the General Staff of the French Army is reported to have said late in 1922 that "In a short service army it is useless to attempt to teach our men how to fight in a future war as well as a present one." A 12 month term of service with the colours will increase this problem for the French. But how about ourselves? On the implied argument a three years' soldier might be taught a little of the future.

Now Territorial artillery must be trained on the same framework of doctrine as Regular artillery, yet it is obviously impossible to think of teaching them more than one thing and not too much

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of that. Training is fully discussed later but the definite effects that its trend has on organisation cannot pass unremarked.

Mechanicalised warfare will inevitably quicken up movements on the battlefield. This means that if artillery is to give adequate support in attack or in defence a more intimate association of artillery with the other arms will be required at every stage of battle and in every phase of war than in the pre-arranged contests of 1914-1918. As soon as a step in this direction is made in the Regular Army it should be made in the Territorial Army also. Close support or anti-tank artillery will probably form a permanent part of lower formations than a division. Artillery units will probably be included in tank formations. In organisation it is necessary to look as far ahead in the case of Territorial as in that of the Regular artillery.

The problem of organisation of new natures of artillery was not solved in the last war. Much difficulty was experienced in organising anti-aircraft artillery, and compared with our adversaries we failed to make use of the trench mortar throughout. Such changes in material will increase and it is the more necessary therefore that they should be practised in peace.

TRAINING.

THE OBJECT OF THE TRAINING PROGRAMME OF THE ENSUING PERIOD.

In conformity with the objects of a new organisation of the Regular and Territorial Artilleries training must be given a new orientation. The lack of sympathy between these two which undoubtedly existed before the last war has not been removed by post-war training. What with the Royal Artillery Mounted Rifles period and the amalgamation of the regiment, the Regular artillery has had its hands full. The mutual co-operation of the war has been forgotten in these eight years. The Territorial gunner is prouder of the "T" below his badge than the emblem that surmounts it. The average Regular soldier has had no chance to learn the spirit of the Territorial Army, but anyone attending a summer's practice camp of alternately Territorial and Regular units will remark that in keenness the Regular can give nothing to the Territorial. The Regular soldier is often accused of think-

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ing of the Territorials as "playing at soldiering"; this is hardly correct—far more often he does not think about them at all. The Territorial rarely thinks of the Regular except as the origin of such aggravations as repeated changes in his drill instructions. But there is really no fault on either side. Regulars and Territorials meet on no common ground. There simply have been no facilities for co-operation. To produce them must be the first object of training.

Just as the units of the Regular Army must be prepared on expansion to sacrifice their organisation in part or in whole to the needs of the Territorial Army, so must training, looked upon from the broadcast point of view, be subordinated to the special needs of the Territorials. This is not to say that valuable methods must be discarded because they present too great difficulties for the training of the Territorial army in peace. Suggestions will be made later for dealing with this problem. But the Regular Army must gradually come to think more of producing large numbers of instructors and of developing methods of intensive training than of producing super-efficient units. This will not be to the detriment of the training of the Regular Army for war. How little prominence has been given in the British Army to developing efficient systems of instruction is shown by the case of the land flying services during the war. If ever there was a subject in which efficient instruction was at a premium it was in the training of pilots during the huge and wonderful expansion of the Royal Flying Corps and Royal Air Force. Yet it was not until very late in the war that a system of instruction was taken up in earnest.

It is of great importance for the training of Territorial units, and especially of senior officers, that there should not be too frequent changes in the method of employment of their arm in war. Even in the Regular Army this question deserves more attention than it has sometimes had. For example, take the case of close support of infantry before the war. In the hustle of practice camps, inevitable owing to the scarcity of ranges and the number of batteries, this was rarely carried out. On manœuvres, and especially on Infantry Brigade trainings, it was almost always attempted, usually with unsuitable improvised signalling apparatus in default of official provision of something better. But field

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batteries went to the war without an official solution of the problem of how this most necessary support was to be given.

It is therefore suggested that a comprehensive doctrine for the employment of all arms should be laid down for definite though alterable periods of four or five years. This is not provided by the training manuals, which are designed to serve a more general purpose. It should be possible in such a cycle to crystallize in the minds of Territorial brigade and battery commanders a solid conception of the method of employment of their units in co-operation with other arms, and such a conception would form a far better basis for the doctrine of the succeeding cycle than the present confusion of ideas due to continual change. The formation of a Tactical Committee to lay down such a doctrine and to explore the possibility of others has often been mooted, and some such authority would be necessary. The current doctrine would be followed by the Regular Army as well as the Territorials. At the same time selected Regular units and formations would be used to try out new theories, and so to assist the tactical committee to formulate the doctrine of the succeeding cycle. Such a committee would be most valuable to co-ordinate the conflicting requirements of the various arms, and to produce a programme of training, progressive within the cycle, for Regular and Territorial formations alike.

An important duty of the Regular Army is to test the practice of the tactics of the moment. Every practice camp and every combined training, whether brigade, infantry brigade, divisional, or on a larger scale, raises questions to which an answer must be found. It has been suggested that at some future date the Regular Army might consist of light divisions, while the Territorial Army would supply the infantry or heavy divisions required. If this were done how could such manœuvres as, for example, the reconnaissance and deployment for attack of divisional and corps artillery ever be practised? In view of mechanicalisation such problems increase in importance, and the 1923 manœuvres showed that many of the difficulties would not be discovered except by practical tests. The problems of decentralisation also present far more difficulties in the field than in the war game. All such questions would take an entirely different form when dealing with light divisions of which

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the tactics and constitution would be completely different. Without regular divisions of the same constitution as the Territorial Army divisions existing in peace, formation training in war would be greatly hampered.

The true objective is that the Regular Army should train in peace to set a standard, and to be ready to assist the Territorial Army on expansion, and that the Territorial Army should train to get ready for intensive methods of preparation for war after mobilisation.

Two theories of Territorial Training, and a choice.

There are two things which the individuals of an army must possess, and which it is the aim of training to produce and foster. Technical efficiency is one of them; its characteristics are that it is definite and measurable. The spirit of the soldier is the other; its characteristics are the reverse. In combination with knowledge, experience and personality it produces in the officer power of leadership and a tactical sense. In all ranks it results in understanding discipline and comradeship. This spirit is latent in a high degree in continental nations more military than ours. It is the more important that our systems of training should strive to the utmost to increase it.

The Regular Army system of annual progressive training aims at producing technical efficiency first; well knowing that the continuous every day life of the unit, and subsequently the annual sub-unit and formation training, and association with the other arms will gradually imbue all ranks with the less tangible attributes. It is true that time is sometimes wasted in the individual training period in retraining. Insist, however, on a greatly increased number of instructors in every unit, and there is plenty to do with the trained soldier of the previous year in the individual training period.

Progressive annual training with technical efficiency as its foundation produces efficient Regular units and individuals. It is a thorough system; there are no holes in it. Conscientiously followed over a period of years it produces an army. But is it the most suitable system to train a Territorial Army in peace time?

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In an especially keen Territorial battery favoured by local conditions, the men may average the equivalent of seventy or eighty drills before the annual fortnight's camp. It is common knowledge that this is not nearly long enough to produce word-perfect technical efficiency. Consequently the results obtained are apt to be discouraging, and this is the first thing to avoid. In the first few years' training after the war it was held that shooting on the range was the quickest way to produce efficient Territorial batteries. There was an outcry when it was suggested that some batteries were unfit to practise, and that the time of others would be better spent if they occasionally trained alongside the other arms of their divisions. Many senior officers, both Regular and Territorial, expressed the opinion that it was much more important that Territorial batteries should practise every year than that they should train with other troops. This shows the tenacity with which this view is held.

Yet if a battery's performance at practice camp is held to be the real test of its progress, its officers and men will concentrate on technical efficiency to the exclusion of everything else. Now technical efficiency lends itself to intensive training while such things as discipline and a tactical sense certainly do not. It is therefore considered that if a sound system of general training can be found it would produce units more ready for intensive training on mobilisation than would training on a basis of technical efficiency. The battle of Valmy is a good example of the fate of those who rely on technical training to produce an army.

Training of Territorial Artillery.

Preliminary training in the Regular Artillery takes the form of individual training, and, as stated before, aims primarily at technical efficiency. In the Territorial artillery it must do more in far less time. In a Territorial battery it is impossible to wait for one stage to be completed before starting another. So long, however, as technical efficiency is not the goal there is no reason why various stages of training should not run concurrently, and this is especially so if extra help in the form of Regular instructors can be given during the early stages. The avoidance of a rigid individual training period has also the advantage of keeping the interest stimulated, which cannot be done by incessant gun drill. There have been

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many attractive schemes for making the men put in their compulsory drills within a short period prior to annual camp, the object being to leave the rest of the preliminary period for individual officer and non-commissioned officer training. This would, however, rob Territorial training generally, and its important social side in particular, of continuity. Again, if more help from Regular instructors could be made available, the object of such schemes which is to permit of thorough individual training of Territorial officers and non-commissioned officers, would be attained.

Too much stress cannot be laid on the importance of preparation of training. Here again Regular officers should be available to help but the hardest work will fall on the Territorial adjutants and staff officers. So valuable is knowledge and experience in the organisation of training that it would be a great advantage if officers going to Territorial appointments could be put through a suitable course or attachment to acquire them.

Discipline and personal smartness must be the basis of the training of all soldiers, whatever their arm or their nationality. Next to this, racial characteristics must be taken into account, and in the case of the British soldier, especially the Territorial, the outstanding feature is that he must understand the reason for everything he is taught. The history of the British Army, of the Regiment, even of the artillery of his own division in the late war will provide illustrations of the necessity for every part of his training.

The importance of technical training is not described. The claims of detailed training in the use and care of arms must be reconciled with the primary importance of general training. But even in the use of arms training must be kept general. For example, the recruit should always be trained in direct and indirect methods of laying, and the officer should never be allowed to look upon the change from one equipment to another as a difficulty. Field artillery has much to learn in this matter from the other branch of the regiment; during the war there was a most persistent and troublesome disinclination among officers to change from the 18 pr. to 4·5″ howitzer batteries. With the development of anti-tank methods and equipments, and of mechanicalised artillery, changes in equipment will necessarily be more frequent, and it is important that this should cause no dislocation.

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In contradistinction to the necessity for infrequent changes of tactical methods, changes in drill and technical methods should be made as soon as they are found necessary. This is very disturbing now when Territorial batteries are striving after technical efficiency, but when the unequal contest is abandoned this bone of contention will vanish. It is necessary that these changes should be kept up to date in Regular units, and it is important that there should be no differences in drill and equipment between Territorials and Regulars.

During preliminary training, as in every other phase, the Regular Artillery should do everything possible to help their Territorial units. A great part of this co-operation would in practice be carried out by the personnel of the depot to save expense. Week-end courses for non-commissioned officers, the loan of signalling instructors, miniature range for officers, equitation and driving instruction, week-end tactical exercises when possible in co-operation with other arms, and courses for fitters in the care of equipment, and presently of their mechanical transport, are instances of the help that might be given.

Two general remarks must be made on the subject of sub-unit and unit training. The first is that it must be the aim of Territorial artillery training to cover the whole ground of battery tactics, even if rather superficially. If a battery is trained however thoroughly in shooting with ground observation at the expense of other methods, the tactics of artillery and their co-operation with the other arms is lost sight of as the basis of training. Predicted shooting, survey methods, and shooting with aerial observation, can be practised in very simple form. All complications such as those involved in calibration, time shrapnel, survey calculations, or even the accurate drill of the aeroplane shoot can be kept out of the training of the battery. The second is responsibility for training particularly with regard to the brigade commander. This is the best preparation for command in war.

In Territorial batteries individual and combined training should be allowed to overlap, for though the thoroughness of true progressive training is lost, the interest is better maintained. Regular units in the command, or failing them, personnel from the depot can help the batteries in sub-unit and unit training by such means as travelling demonstration gun drill squads, the use of horses and

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other facilities for week-end camps, and by the help of specialist personnel to assist in the training of their battery staffs. Training by demonstration is a method of which insufficient use has been made. Where depots and units are suitable located accommodation and training grounds should be made available for Territorial units, especially for week-end camps or courses. Such training is at the present time well organised by the London District.

The annual camp is the only real chance of continuous training on a definite programme. It is important that it should be varied so that within each tactical cycle each battery should practice, train with the rest of its brigade, carry out a combined training with an infantry brigade, and attend a divisional camp. The claims of an occasional "holiday" camp to reduce the hardship of continual trainings in bleak and inaccessible military stations such as Catterick and Trawsfynydd must be regarded. It is the only holiday for many, and it is against the interests of all to risk making Territorial service unpopular. It would be valuable as an experiment to make Territorial batteries do occasional trainings at the station or camp of a Regular artillery brigade of their command, and also for Territorial brigades to take part in Regular divisional or inter-divisional trainings. The preliminary training of each year must be regarded as a special training for the annual camp according to its nature, and so within each cycle a complete general training would be achieved. In view of the more intimate grouping of arms that mechanicalised warfare is certain to bring about, combined training must be encouraged, and it might be advisable to withdraw the necessity for asking for permission to hold brigade or divisional exercises. Above all, Territorial artillery must be taught that practice camp is not the climax of their training, but that their highest aim must be to fit themselves to take their place in their formation.

Training of Regular Artillery.

Stress has already been laid on the primary importance of producing a far larger proportion of instructors in Regular units than are required for the units themselves. There remain, however, a few observations to make. The first is that up to the present many Regular units have not made the most of their non-commissioned officers. As an instance, in 1922 before practice camp it was

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suggested to brigade commanders that selected non-commissioned officers should shoot short series. One brigade commander said that his non-commissioned officers were unsuitable, and that he would like to wait until the younger class had grown up. On the other hand, out of one battery in another brigade, trained under exactly the same conditions, no less than nine non-commissioned officers took series, and very successfully too. Non-commissioned officers can be taught minor tactics on the simplest exercises without troops; in anti-tank tactics much responsibility will always fall on the non-commissioned officer, and he can and must be taught to prepare for it. The next point is that training in administration is even more essential than any other form of training. It is the bedrock of efficiency at all times, and overwhelmingly so on expansion.

A special campaign should be made for the development of methods of intensive training. The probability of shortage of equipment on expansion must be taken into account, and patterns and uses of improvised equipment should be tested. This could be carried out most conveniently by the depots. The methods and apparatus used at the Royal Artillery Base Depot at Havre in the end of the last war would provide a good starting point for enquiry into the possibilities of intensive training with improvised material.

The difficulties of unit and sub-unit training are primarily difficulties of lack of personnel. The bugbear of the drafting system and the toll of employment can be made to show conclusively the impossibility of ever training batteries at all. Yet batteries do get trained, and many of them very well trained too. The disappearance of the horse and of long stable hours will bring much relief during all periods of progressive training. Also if Regular units would come to look on formation training instead of practice camp as the climax of their training this would have the effect of lengthening the training season. The month of August being the most suitable for Territorial camps, July usually sees the close of the Regular practice camp season, and the unit training of the many batteries that must necessarily practise early in the season is very hurried. The extent to which the bogey of practice camp still holds the Regular artillery in thrall is shown by the answers to the proposal that two brigades should normally practise together, and that camps should last a month. The typical answer was to the effect

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that it was found difficult to "keep the men up to concert pitch for so long a time"! The importance of practice, on the other hand, must not be underrated. So great is its value and so short is the time available, that it is considered that full opportunity should be taken to teach batteries and brigades to shoot, neglecting, intentionally if necessary, opportunities for teaching tactical lessons which can be learnt elsewhere.

In view of probable changes of equipment it should be the aim to train Regular batteries in the use of a secondary equipment in addition to that with which they are armed. This should easily be carried out in all units which have no horses to look after.

Among the most valuable exercises in the period immediately preceding the war were those of field artillery brigades attached to infantry brigades during the latter's brigade training. Apart from the combined exercises themselves the junior officers of both arms were brought more closely into touch with each other than in any other form of training. If it is correct to say that mechanicalisation will bring about a more intimate grouping of the arms, then combined brigade training of artillery with infantry, cavalry and tanks becomes more important than ever. The attachment of Territorial batteries during this period is an experiment which should be tried.

It is important in the case of Regular artillery training that the specialised development of the tactics of individual weapons should be encouraged. It is true that the specialised tactical training of weapons in peace has often been found unsuitable in war. But if it fails in one case it will succeed in others. Much of the pre-war training of all the field artilleries of Europe was found wanting in the last war. General Bruchmuller in his book on the German artillery gives it as his opinion that the success of the German artillery in the earlier phases of the war was due to the official encouragement of the development of heavy artillery tactics in the face of much opposition. The use of Regular artillery training to set a standard for training on expansion makes this advanced tactical training the more important.

Every other nation which depends for its main army on "part time" forces keeps a certain proportion of Regular officers and non-commissioned officers to assist in its organisation and training. Our own Dominions and Switzerland are examples. We will not

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get smooth, rapid and efficient expansion unless we do so too, and this applies particularly to artillery. There is no sign of any such plan at present, and the Regular artillery is not prepared to do its part in helping the Territorial artillery.

If the inevitable amalgamation of the Regular and Territorial artillery on the outbreak of war is to be a success, these two components must understand each other and must get to know each other in peace time. The time for Territorial training is so short that if this is to be achieved Regular and Territorial artillery must meet in training at every point.

To obtain this homogeneity it is suggested that the Regular and Territorial artillery should be united in fact as well as within the cover of the Blue List and that the regiment should then be divided into command artilleries, partly Regular and partly Territorial. There would then be competition among the most efficient and suitable officers to become Territorial adjutants, and among the most energetic and ambitious non-commissioned officers to join the Territorial permanent staff. At present these posts are backwaters, and officers and non-commissioned officers alike feel that they get out of touch with the Regiment, and that the good work they do is not appreciated. Attachments of Territorial officers to Regular units would produce much better results in that regular battery and brigade commanders would take a far more real interest in Territorial officers attached to the units they command.

Regular and Territorial artillery should have the same training. It is too much to expect that Territorial officers and units would cover the whole ground in one year, and indeed it is too much for the Regular also. Therefore, a cycle of tactical training is suggested. In this time the Territorial artillery could cover the whole ground generally, and Regular artillery could develop and put to a practical test the specialised tactics of the weapons with which they are armed. Territorial artillery training should be kept as general as possible, technical efficiency being obtained by intensive training after mobilisation.

It has been said of Queen Victoria that "she half unconsciously transformed the English Monarchy from a thing, the possibilities of which were exhausted, into a thing whose possibilities are unlimited." Some such transformation is necessary to fit the artillery, perhaps the whole Army too, to face the problem of expansion.

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SOME NOTES ON MOROCCO.

By Major-General Sir Webb Gillman, K.C.M.G., C.B., D.S.O.

THESE notes are the outcome of a visit to French Morocco in October, 1925. Accompanied by Lieutenant-Colonel B. C. T. Paget of the Oxfordshire and Buckinghamshire Light Infantry, I had the good fortune to be invited to Morocco by the French Ministry of War, and, though my visit was a short one, I was enabled, through the excellent facilities placed at my disposal, to visit the greater part of the French front, and to study the campaign fully. At the outset of my remarks, I desire to pay a special tribute to the cordiality with which I was welcomed, to the frankness and hospitality with which I was treated, and to the facilities and concessions for travelling which I was given.

My visit was brought to an end by the advent of the rainy season at the end of October, and, with the rain, operations also had to cease owing to the great difficulty of communications. Now, in April, 1926, as I write these notes, the cessation of the rains will enable operations to begin at any moment, but as a peace conference is being held at Ujda other results are hoped for.

Politically Morocco is divided into three parts, though the whole is nominally under the Sultan, who is in reality a servant of the French, and never leaves the French Protectorate. These three parts are:—

(a) The Spanish Zone in the north—a narrow strip of mountainous and largely barren country bordering the Mediterranean, which the Spaniards, in spite of half a century of effort, have failed to pacify except in the eastern and western extremities.

(b) The internationalised and demilitarised zone of Tangier, some 200 square miles in extent, in the extreme N.W. corner. This almost faces Gibraltar, and is of great strategic importance at the western entrance of the Mediterranean.

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(c) The French Protectorate about the size of France, which was declared as such in 1912 and which forms by far the largest part of Morocco : it joins on the east with Algeria, and extends southwards across the Great Atlas to an undefined line in the Sahara.

Our interest in the partition of Morocco is chiefly concerned in securing the safety of the waterway through the Straits of Gibraltar, and we have taken the precaution of insisting that the northern part of Morocco should be leased to a power unlikely to be unfriendly to our interests in case of a great war, and that the Tangier Zone should be internationalised and demilitarised. This partition was settled in 1912 and the French Protectorate declared, but the details of administering the Tangier Zone were not settled till 1923 under what is known as the Tangier Convention by agreement between Great Britain, France and Spain.

The frontier between French and Spanish Morocco has never been delimited on the ground, except for some 40 miles at either end, but it is understood to run as shown in the map.

The original inhabitants of Morocco were the Berbers and they still exist as pure stock chiefly in the mountains of the Middle Atlas and Northern Morocco, and are divided up into a large number of tribes. They are a fine fighting race of hillmen, not so good as are found on the North West Frontier of India, but good enough to have survived repeated invasions by the Phœnicians and Carthaginians B.C., the Romans in the 1st to 3rd Centuries A.D., the Byzantines and the great Arab invasions of the 7th Century which swept on into Spain and France. This last was the only one which left its mark by the introduction of Mohamedanism, and the extensive inter-marriage of the Berber and the Arab, resulting in what is now called the Moor who lives on the plains. Even to this day the tribes now fighting under Abd-el-Krim in Northern Morocco and some of those in the Middle Atlas, have never been defeated by an invader.

In spite of his proximity to Europe, the Berber is a very primitive creature and has no written language : Abd-el-Krim's own tribe in the Riff is said to be entirely uneducated and unable to read or write, and to be quite unaffected by western civilisation. Abd-el-Krim himself is well educated, and Mr. Harris, the well-

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known "Times" correspondent at Tangier, has a high opinion of him and considers him to be far superior to the late Raisuli in every way. His special gift is more of a political than a military nature, owing to his having a wonderful grasp of tribal psychology and political views, which enables him to gain and retain the allegiance of, not only his own, but the other tribes that serve him. His brother Mohamed has the greater military knowledge and is responsible for most of the Riffi military plans and organisation.

The French began operations in Morocco in 1907, though their Protectorate was not declared till 1912: they have made steady progress in the pacification of the country ever since, working simultaneously from east and west, until by 1923 there remained to be occupied only certain areas of the Great and Middle Atlas, and a narrow strip in the north separating the French from their political frontier with Spain.

As regards the Spanish, the outstanding points with regard to their operations, are that in 1921 they had two armies operating in their zone, one based on Tetuan against Raisuli, and the other based on Melilla with the object of moving west and joining hands with the western force. The eastern army, however, met with complete disaster at the hands of Abd-el-Krim at Anoual, its losses amounting to 14,472 men, besides large quantities of arms and stores. This disaster increased Abd-el-Krim's prestige, and he continued his successes against the Spaniards till by 1924 he had forced them to abandon all their posts between Tetuan and Sheshawan. He further strengthened his position by capturing Raisuli and the money in his possession.

While Abd-el-Krim was thus flushed with success, the French who hitherto had not advanced north of the River Ouergha, decided to push northward in July, 1924, with a view to occupying all the territority up to their political frontier, and putting a stop to the frequent raids into what is, and has been since 1912, recognised as territority within the French Protectorate, namely the country draining into the River Ouergha.

This advance by Maréchal Lyautey met with considerable comment at the time, and amongst the reasons put forward by those opposed to it were:—

(a) that up-to-date Abd-el-Krim had never attacked the French

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and had been quite prepared to be on good terms with them provided that he was left alone;

(b) that if he made a serious offensive against the French advance, as in fact he did, it might lead to big things for which they were not prepared;

(c) that in any case it was a mistake to stir up trouble on the northern front, whilst so many troops were still required for the pacification of the Middle Atlas.

It is easy to criticise after the event, but the forces at the Maréchal's disposal were undoubtedly insufficient to deal with any trouble which might occur. As it was, the advance was carried out by only 11 battalions on a front of about 60 miles with 4 battalions in reserve. At first there was practically no opposition, and the French successfully established a line of posts north of the Ouergha linking up to the Moulouya in the east and Ouezzane in the west, but in touch with the Spaniards only at these extremities. By the end of 1924, however, it was evident that there was probability of trouble from Abd-el-Krim in the coming Spring, and Maréchal Lyautey asked Paris for reinforcements of from 24 to 40 battalions. His request, however, was not acted upon in time, and when Abd-el-Krim struck only 3 battalions had arrived.

At this juncture Maréchal Pétain was sent hurriedly out from Paris to Morocco, to take charge of the military situation, and was able to persuade the French Government, as the result of his personal reconnaissance, that large reinforcements were required. They were accordingly despatched.

Abd-el-Krim's first effort was directed against Fez, and he appears to have failed to reach it because his effort was not sustained. His forces lacked the necessary cohesion and organisation, and he seems to have worked on a system of limited tribal objectives, each tribe or series of tribes being given the congenial task of looting the tribes immediately to the south of them.

Having failed to reach Fez he changed his tactics and stirred up trouble on a wide front from Taza to Ouezzane, sending his agents, backed by comparatively small parties of Riffi, to terrorise the tribes into revolt. At first the French could do very little to stem the rising tide of rebellion, owing to lack of troops: in many cases their posts were completely surrounded and cut off for days

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and sometimes weeks, and could only be supplied by aeroplane. I was informed that 6 were captured after the most gallant resistance, one was blown up by its commander together with the garrison, and that 25 were evacuated and destroyed. There were then evidently far too many small posts scattered along the front, but the French have learnt their lesson and the minimum garrison of a post is now at least two companies of infantry with a proportion of artillery, whilst further to emphasise the change of policy the word "post" has been replaced by the term "position organised for defence."

The most dangerous day for the French was 2nd July, 1925, when the situation north of Taza was critical. Had Taza fallen, disaster must have ensued, because the only line of communication with Algeria would have been cut, and the revolt would, in all probability, have spread very quickly all along the Middle Atlas.

Reinforcements were hurried to the assistance of the garrison, and fortunately, also, Abd-el-Krim again failed to push his attack home, owing to lack of cohesion and organisation. By the 20th July, sufficient reinforcements had arrived in Morocco to make their weight felt, and the tide turned rapidly in favour of the French. Maréchal Pétain hoped at one time that it would be possible to crush Abd-el-Krim and obtain a decision before the winter rains set in, but owing to a variety of causes, this was not possible; the chief difficulty was the great problem of supplying large forces in an undeveloped country.

By the end of October, the French held a line of strong and well sited posts along their northern front, and are up to their political frontier in the east, as fixed by the Madrid Conference in 1925, though they are still some distance short of it along the rest of the front. Behind this line of posts are local reserves in close support and behind these again are strong general reserves at Taza, Fez and Rabat.

When the rains set in, the primary requirement of the French was good and sufficient roads, and during the recent winter they set themselves to this work with a will. One only has to look at the photograph facing p. 183 to see what a difficult task this has been.

While Maréchal Pétain was clearing the Riffi dissidents out of French Morocco, the Spanish under the able leadership of Primo

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de Rivera effected a successful landing just west of Alhucemas Bay, and after seizing Ajdir, Abd-el-Krim's own town, established themselves strongly on a perimeter round part of the bay and held it during the winter with about 18,000 men.

It has been said that one of the chief causes of the French setback was that they placed too much confidence in the loyalty of tribes recently submitted and were caught by surprise when these rose in revolt in their rear. This may be true to some extent, for the French in the past have placed great faith in the tribes, once they have submitted, and until last year there was never a case of this confidence being abused. But it is probable that it was more fear of Abd-el-Krim than actual disloyalty to the French which led to these risings and, though his agents were very successful, it is doubtful whether they would have succeeded had the French been able to maintain adequate garrisons in the disaffected areas. As a proof of this, many tribes were quickly re-pacified as soon as the French could make a show of force. Those which revolted in many cases had no option but to throw in their lot with Abd-el-Krim, or be annihilated. It is perhaps interesting to note that the French have dealt very leniently with these tribes, like the Branes and Tsoul, which have come in. As punishment a fine of 5 francs per family was imposed and one man of every two families made to work on the roads. Each of these tribes consists of about 3,000 families, and each family is computed at about $4\frac{1}{2}$ head = 1 rifle.

The difficulties which the French have had to contend with should be carefully considered. First of all they have had to depend on a conscript army with its 18 months compulsory service as compared with our longer service volunteer army. This means a turn over of their rank and file during this short period, in which the conscript is available for operations for only about 9 months. Assisting the conscript army are the local levies, the colonial troops from Annam, Madagascar, Senegal, Algeria and Morocco, and the Foreign Legion. The local levies are of varying degrees of efficiency, and the Foreign Legion is always used as a stiffener when any serious fighting has to be done, and has proved invaluable. It is composed of 65 per cent. of Germans, 15 per cent. of Russians and the rest mainly Swiss or Balkanese, all of whom enlist for 5 years, no questions being asked. The French possess no colonial

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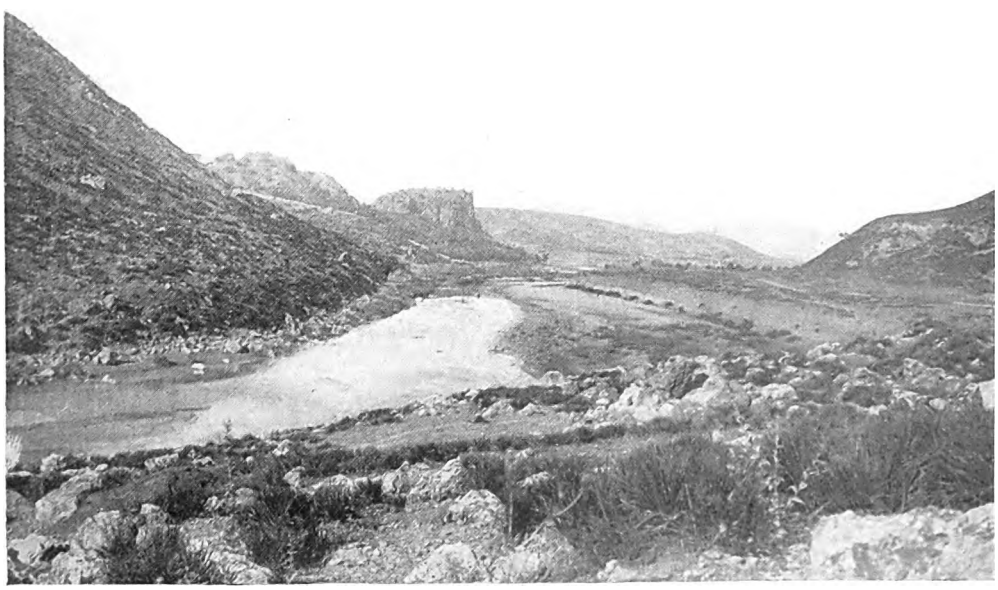
Looking N. towards AJDIR (25m.) from BAB SULTANE.



R. OUERGHA near AIN AICHA in dry weather.

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troops who are expert in hill warfare, like our Gurkhas and Pathans, and consequently have no one who can defeat the Riffi at his own game of lying in scattered bushes and sniping. "Crowning the heights" produces but little effect.

The Riffi is very mobile, requires no supply columns and can exist for several days on what he carries with him. He is a good shot and taking him all round is a very capable guerrilla warrior. Another difficulty is the lack of good and sufficient roads as can clearly be seen in the photograph of the country near Tizi Ouzli. This difficulty is increased by the fact that the hills are composed almost entirely of clay, and marching along the few goat tracks which exist, is both difficult and dangerous in rainy weather. The country near the frontier consists of range upon range of mountains running up to 5000 feet or more, the slopes being covered with scrub oak and other bushes, affording excellent cover for scattered troops.

The Riffis have a few captured guns, but are short of ammunition and the use of artillery by the French is chiefly devoted to the close support of their advancing infantry and consists almost entirely of mountain guns. The paucity of these guns, the invisibility of the enemy's snipers and the great difficulties of terrain have however made this close support, as we understand it, very scanty. The usual method adopted is to bomb any position about to be attacked for several days previously by aeroplanes, and then to spray it with all available artillery for some hours before the infantry advances and to lift by time table during the advance. The French have used a lot of ammunition, partly to produce a moral effect, and partly in the hope that by expenditure of materiel they will save in personnel—a matter that is important at the moment in France.

The equipments in use are the 65 m/m mountain gun, a few of the new 75m/m Schneider mountain guns, and some 75m/m field guns and 155m/m howitzers for defence positions. A battery of long range 155m/m guns was got as far as Kiffane but its lack of mobility prevented its use.

No gas or smoke shell have been used.

The only tank in use is the light Renault weighing 6½ tons. This has a crew of 2 men and is armed with a machine gun or a

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37$^{m/m}$ gun. On tracks it can go 1½ to 2 miles an hour, but it also can be carried in a lorry into which it climbs backwards along two light ramps (see photo). These tanks were used with success in the lower hills—say up to 2000 feet high—being invulnerable to snipers, and being utilised to clear the slopes covered with brushwood, and to hold them until the infantry arrived. Their steel tracks are liable to become damaged over stones or rocks. They are not now used over such kind of ground. India-rubber tracks are reported to have been unsatisfactory.

Aeroplanes were used for bombing back areas in rear of objectives to prevent the enemy from concentrating, but the absence of targets, and the fact that the Riffi has no supply columns or roads, has minimised their value in this respect. They have been particularly useful in the evacuation of wounded for which purpose two types of machine exist, and for photography. Their losses have been heavy, amounting to 1 in 10 machines: they often have to fly low, up valleys to locate targets or for reconnaissance purposes, and, being at times below the crest line, give the Riffi sniper a comparatively easy shot.

To sum up, my personal impression is that when the difficulties with which the French were confronted in July, 1925, are taken into consideration, the results which have been achieved by them when the rains brought operations to a close in 1925 are remarkably good.

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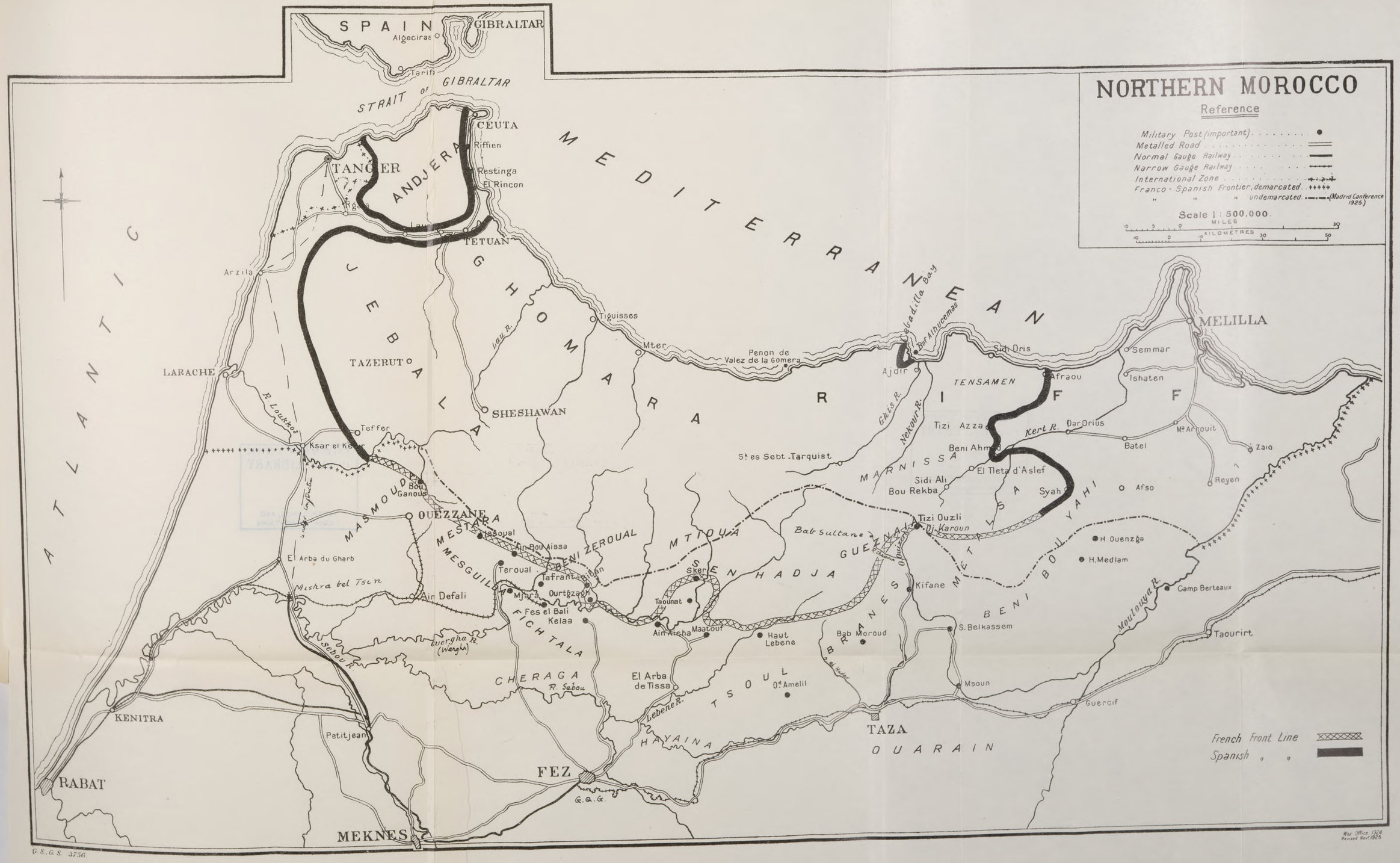
NORTHERN MOROCCO
Reference
Military Post (important)
Metalled Road
Normal Gauge Railway
Narrow Gauge Railway
International Zone
Franco-Spanish Frontier, demarcated
" " " undemarcated
(Madrid Conference 1925)
Scale 1 : 500,000
MILES
KILOMETRES
SPAIN
GIBRALTAR
Algeciras
Tarifa
STRAIT OF GIBRALTAR
CEUTA
Riffien
Restinga
El Rincon
TANGIER
ANDJERA
TETUAN
MEDITERRANEAN
ATLANTIC
Arzila
LARACHE
JEBALA
TAZERUT
GHOMARA
Tiguisses
Mter
Penon de Valez de la Gomera
Sebadilla Bay
Bor Alhucemas
Ajdir
Sidi Dris
Afraou
TENSAMEN
RIFF
MELILLA
Semmar
Ishaten
Tizi Azza
Kert R.
Dar Drius
Batel
Mt Arrouit
Zaio
Reyen
Afso
Beni Ahmed
El Tleta d'Aslef
Syah
Sidi Ali
Bou Rekba
Tizi Ouzli
Dj. Karoun
Sk es Sebt Tarquist
MARNISSA
Ghis R.
Nekour R.
SHESHAWAN
Lau R.
Teffer
Ksar el Kebir
R. Loukkos
Bou Ganous
OUEZZANE
MASMOUDA
MESTARA
Issoual
Ain Bou Aissa
BENI ZEROUAL
MTIOUA
Bab Sultane
GUEZNAIA
METALSA
BENI BOU YAHI
H. Ouenzga
H. Medlam
Camp Berteaux
Moulouya R.
Taourirt
El Arba du Gharb
Mishra bel Tsin
Ain Defali
Teroual
Tafrant
Bilan
Mjara
Ourtgzagh
Fes el Bali
Kelaa
MESGUILDA
FICHTALA
Sker
SENHADJA
Taounat
Ain Aicha
Maatouf
Haut Lebene
Kifane
BRANES
Bab Moroud
S. Belkassem
Msoun
Guercif
TAZA
OUARAIN
Ouergha R. (Wergha)
Sebou R.
CHERAGA
R. Sebou
El Arba de Tissa
Lebene R.
TSOUL
Od Amelil
HAYAINA
KENITRA
Petitjean
RABAT
FEZ
G.Q.G.
MEKNES
French Front Line
Spanish " "
War Office 1924
Revised Nov. 1925
G.S.G.S. 3756

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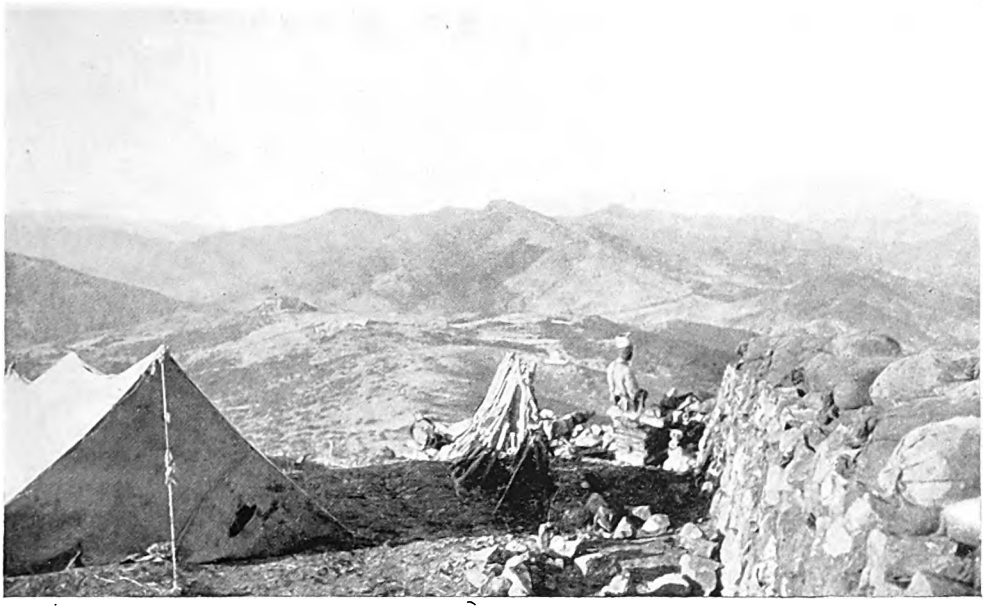

Looking N.W. from BOU GANOUS, (OUEZZANE) post.

"Char porté" (Light Renault tank climbing backwards into lorry.)

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THE TACTICS OF PENETRATION.

By Colonel J. F. C. Fuller, D.S.O.

Introduction.

FOR many years before the outbreak of the war in 1914, the grand tactical idea which dominated military thought was that of envelopment. Personally, a close study of the envelopments attempted during the Russo-Japanese War led me to expect that in the next war this method of victory would be more difficult to apply with decisive results than it had been in the past, and in April, 1914, I wrote an article, bearing the same title as the present one, which was published in the Journal of the R.U.S.I. of November, 1914. My reasons for doubting the official doctrine of the day were: that the size of modern armies was likely to impede rapidity of manœuvre and control; that trenches and wire were easily constructed and powerful obstacles, and that machine-guns and quick-firing artillery, if massed, should be able to blow a hole through an enemy's front. Though to-day my opinions differ considerably in detail from those I held in 1914, my main point, namely, that the modern field gun had become the superior weapon of war, I consider was correct. Further, I am still of opinion that this will hold good until such time as armies mechanicalise, when tactical envelopment will come back into its own.

The war was so static and battles of penetration were so frequently fought, especially on the Western Front, that it seems curious, yet I believe it is a fact, that no military writer has so far attempted to analyse the tactics of penetration and to deduce their nature from the numerous trials made in these tactics during the war. This problem I will now examine.

Strategical Conditions on the Western Front.

To understand the problem of tactical penetration which faced the French and ourselves from November, 1914, onwards, it is necessary to visualise correctly the nature of the strategical condi-

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tions which existed on the Western Front. Here, in August, 1914, German strategy was largely influenced by the strategic salient in which the French Armies were compelled to deploy, namely the Belgian frontier from the Channel to Longwy, and the German frontier from Longwy to Basle. By the end of October, the race to the coast was completed, and this salient was replaced by one of a tactical nature, a trench line running from Nieuport *via* Arras to Noyon, thence *via* Reims to Verdun and from Verdun to Basle. The sector Verdun—Basle was of little tactical importance compared to the sailient Nieuport—Noyon—Verdun which may be divided into three areas—the Flanders area on the northern flank, the Ardennes area on the southern connected by an area of open country in between, the axis of which is traced by the rivers Oise and Sambre. Flanders and the Ardennes are obviously good defensive areas for both are a mass of obstacles—dykes, canals, scattered farmsteads in the one, and mountains and forests in the other. The Sambre—Oise is a natural and historical approach into north-eastern France, and the area these rivers run through may be classed as good offensive country.

Across the salient Nieuport—Noyon—Verdun runs the railway from Thionville, Mézières—Valenciennes to Lille, and from it southwards and westwards run a great number of lines. Its two most important junctions are Mézières and Valenciennes, and they lie on the inner flanks of the two defensive bastions—Flanders and the Ardennes. The first is 35 miles from Arras and the second 45 miles from Reims. The Thionville—Lille line was vital to the retention of the salient by the Germans, for if either Valenciennes or Mézières were lost the result must inevitably lead to an evacuation of the greater part of north-eastern France; if both were lost then to a retirement to the line Antwerp—Brussels—Namur—Thionville.

In November, 1914, the tactical problem which faced France and ourselves was how to pierce the Nieuport—Noyon—Verdun salient, for envelopment was no longer possible.

The Spring Offensive, 1915.

The closing operations of 1914 showed that infantry were incapable of penetrating a trench line defended by wire and

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machine-guns; that the attack must become more methodical; that strong forces must be concentrated at one point, not many, and that the infantry assault should be prepared by a heavy surprise bombardment carried out by as large a force of artillery as it was possible to assemble.

The British spring offensive opened with the remarkable little battle of Neuve Chapelle. Only two divisions were employed on the first day, and the frontage of attack was about 3500 yards; yet thanks to an intense and rapid bombardment which lasted 35 minutes a definite penetration was effected.

This battle was mounted on a correct understanding of what penetration required, namely, surprise; but the frontage attacked was so small that it was doomed to failure; nevertheless the idea underlying it was greatly in advance of anything attempted on the Western Front since the battle of the Marne.

The battle of Neuve Chapelle, which was fought on March 10 to 13, was followed, on April 22, by the German attack at Ypres, in which gas was for the first time used on the Western Front. The attack came as a complete surprise. A small penetration was effected, but once again the gap was rapidly blocked.

The main spring offensive opened on May 9 by a con-joint attack of French and British forces in Artois; the former directing their operations towards the Aubers Ridge and the latter in the direction of Lens. The French attack is of some interest as it shows that method is rapidly replacing surprise as the main idea of the attack. The trenches are carefully prepared, the reserves being accommodated in the trenches themselves. A preliminary bombardment lasting six days is carried out by the artillery of three corps supported by 350 heavy guns and howitzers on a front of 16,000 yards. The only surprise to the enemy was the hour of the assault which, when made, effected a penetration of some 3,000 yards on a frontage of 6,000. The result was distinctly disappointing. The French reserves were delayed in getting out of the trenches, and the Germans rapidly closed the gap. Method in this battle had in fact been less successful than surprise at Neuve Chapelle, and it cost far more in casualties.

The lessons which the French deduced from this battle were as follows:—

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(i) Penetration by frontal attack is only possible if the attack is methodically prepared.
(ii) Preparation entails a prolonged and accurate bombardment which will obliterate the enemy's defences.
(iii) Obliteration must be carried out on a front of sufficient width to leave a zone unswept by the enemy's fire in the centre of the salient formed by the attack.
(iv) The front to be attacked should be free from villages and strong tactical positions.
(v) The reserves must be so placed as to be able to take immediate advantage of the penetration.

Nothing was said, as far as I know, about surprise, and yet surprise was the one thing required.

The Autumn Operations, 1915.

So far the battles had been made against one point and all had resulted in failure. Now the idea of a dual penetration was to be tried out. In brief this theory was, and I shall examine it more fully later on, to pinch off the Arras—Noyon—Reims salient by two attacks, one from the east and one from the south, the axes of which would meet at about Namur.

A dual attack of this nature was launched on September 25. The eastern attack was carried out by British and French forces at Loos and in Artois, and the southern by a French force in Champagne.

The Champagne attack was the most important operation yet mounted. General Pétain was allotted 30 infantry divisions and 7 cavalry divisions, and in all he had under his command some 3000 field, and 2000 heavy guns. The front of attack which ran from Main-de-Massiges to d'Auberive was about 26,000 yards wide, and had been selected from the point of view of eventual cavalry action.

Opposite this front the Germans had constructed two systems of defence, the second some 5000 yards in rear of the first. To penetrate these, a prolonged bombardment would be required, as both were to be simultaneously destroyed, for it was intended to push the infantry attack through in one bound. In fact the infantry objectives were unlimited.

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To use infantry in this manner was to ask for trouble, and the French certainly got it, for by the time their troops had penetrated to a depth of some 3000 yards, such disorder had developed that the attack came to a standstill. Nevertheless, 15,000 Germans were captured as well as 100 guns.

The French now examined their failure and came to the following conclusions :—

(i) That there had been a lack of co-operation between the artillery and the infantry, and that in future the only duty of the field guns is to support the infantry.

(ii) That the reserves should not be placed in the same area as the attackers, for if this is done they will be disorganised by the counter-bombardment of the enemy.

(iii) That, if the second line of the enemy's defences cannot be reached by field but only by heavy artillery, it should not be attacked by infantry.

(iv) That it is not possible to carry two defensive systems in one bound, and that directly the first is captured a methodical attack must be mounted against the second.

(v) That a successful attack inevitably demands severe loss of life and an enormous expenditure of gun ammunition.

After this attack General Pétain laid down that attacks against entrenched positions should be divided into two phases :—

Attrition: "The attrition of the enemy will only be effected by a general pressure of all the allied forces, an operation which should aim at occupying objectives of limited depth without attempting to effect a penetration."

Decision: "When the attrition of the enemy is considered to be sufficient, then only will the decisive attack begin, and it should be launched from several well chosen positions in successive assaults on frontages of at least 20 kilometres."

And now briefly to review the changes of tactical ideas during this year. The year opened by vain attempts to hurl men through barbed wire. Little by little it was discovered that it was no longer the infantry who attacked but the artillery; that it was first necessary to destroy the defences of the enemy before attempting to capture them. The lesson of this year in fact was: "Artillery conquers and infantry occupies." Tactics were thus reduced to a

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matter of push of pikes, or rather push of shells; drill took the place of manœuvre, method of surprise, and shell fire replaced leadership. Tactics were in fact reduced to the level they held under the Spartans in the fifth century B.C.

The Battles of Verdun and the Somme, 1916.

The failure of the unlimited infantry attack, and the preponderating influence of artillery on tactics introduce the period of the great artillery battles in which infantry move at a slow march behind hurricanes of shells, and merely collect prisoners, or occupy positions, without fighting. Since 1914 the whole aspect of tactics has changed, and these changes reach their culminating point in 1916.

During this year two stupendous battles of attrition are fought on the Western Front, namely the battles of Verdun and the Somme. I will now outline their character.

The first of these battles was a strategical defensive operation carried out to frustrate and delay the projected attack of the French and British armies, and so gain time for the Germans to finish with Russia. The battle of Verdun opened on February 21 with a surprise attack, for though the French knew that an attack in this area was impending, they expected it to open with the usual prolonged bombardment. In place, after a violent cannonade, lasting only a few hours, the infantry attack was launched, and succeeded in making considerable headway, not so much because the German guns had destroyed the French wire and trenches, but because the garrisons of these trenches had been demoralised by the intensity of the bombardment. By the 24th Verdun itself was in danger of being captured, but the French had now recovered from their initial shock, and every further attempt was frustrated in spite of the fact that the battle was continued for another four months. In all, a penetration of 12,000 yards was effected at a cost of some 500,000 men to the Germans and probably not less than 350,000 to the French.

The battle of the Somme was first considered in the autumn of 1915. The attack at Verdun in February upset, however, all plans, as the British army had to extend its front by relieving the French forces in the Arras area. The idea behind this operation

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was to render Amiens more secure by driving the Germans eastwards. Further, it was hoped that, if the attack could be pushed forward on a wide front, a sufficient gap would be made to enable the cavalry to advance on Cambrai and cut the Thionville—Lille railway and so unhinge the German communications. The preparations were methodical in the extreme, and little attempt was made to disguise them, in fact it was impossible to do so. The surprise of this battle was to be an artillery one, not a bombardment but a rolling barrage under cover of which the infantry would slowly move forward from objective to objective. Machine guns were increased in number, and the French infantry were partially equipped with an automatic rifle.

The preliminary bombardment was a prolonged one. On the British front it lasted for eight days, and no less than 2,000,000 shells were fired. On July 1, the attack was launched on a 25 miles front. The French gained some ground and so did the British right, but the British left met with a serious check, and by the end of the first day our losses totalled no less than 40,000; the battle was in fact a tactical defeat. Nevertheless it was continued until November 18 and at terrific cost to all sides; it was not only a battle of attrition but of mutual destruction. If ultimate success could be reached only by battles of this nature, then it was clear that the side which could put in the last 100,000 fresh men was going to win the war.

The Tactics of Single Penetration.

Both the battles of Verdun and the Somme aimed at effecting a single penetration by overwhelming artillery fire directed at one point in the entire front. I will now examine these tactics.

In slow methodical frontal attacks of penetration against an entrenched position, a battle salient is formed, and the understanding of the nature of this pocket is the key to all these operations. The main reasons for its formation are:—

(i) That it is necessary to protect the flanks and rear of the attacking force.

(ii) That artillery protection on the flanks is limited by the arcs of fire of the guns.

(iii) That hostile weapon pressure on the flanks tends, as the troops advance, to round off the attack.

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(iv) That losses invariably tend to contraction towards the axis of the attack.

(v) That fear generally tends to induce men "to bunch" inwards, that is away from the exposed flank.

(vi) That, as the centre is more securely protected by and against fire than the flanks, the advance here is more rapid than on the wings of the attack.

(vii) That, as the centre is freer from the enemy's fire than the flanks, its supply is safer, and, consequently, more rapid.

(viii) That, as the advance of the centre is generally along a line running at right angles to the original front, its movement is less complicated than those of the flanks.

These are the chief reasons, and from them may be established a practical theorem for battles of penetration, which can be tested by the measurement of actual battle salients, namely, that the flanking angles of a determined attack incline inwards at approximately 45 degrees. If, therefore, a penetration is to be effected, its eventual depth will bear a close relationship to the width of the original frontage attacked.

The question now arises, how wide, from flank to flank, should the final frontage be, for, if this width can be decided on, then the width of the initial frontage to be attacked can be guaged, and a rough estimate of the strength of the forces required to effect a penetration between these two frontages can be calculated.

The controlling factor in this calculation is the final frontage, which must be sufficiently wide to permit of a large force passing through the centre of the gap unaffected by hostile fire on the flanks. This gap must, therefore, be about 15 miles in width, and as this width will bear a definite ratio to the initial frontage, the width of the initial frontage may be arrived at by measuring the distance between these two frontages, multiplying it by two and adding this distance to the width of the front to be penetrated. Thus in diagram 1: If the width of the gap is A.B. and the distance between it and the base L.M. is C D, E F will equal A B+2 C D, in this case 15 miles+2×5 miles, that is 25 miles, and the defiladed interior cone J.H.C.I.K. will have a base of 15 miles and a truncated apex of 5 miles free from most projectiles.

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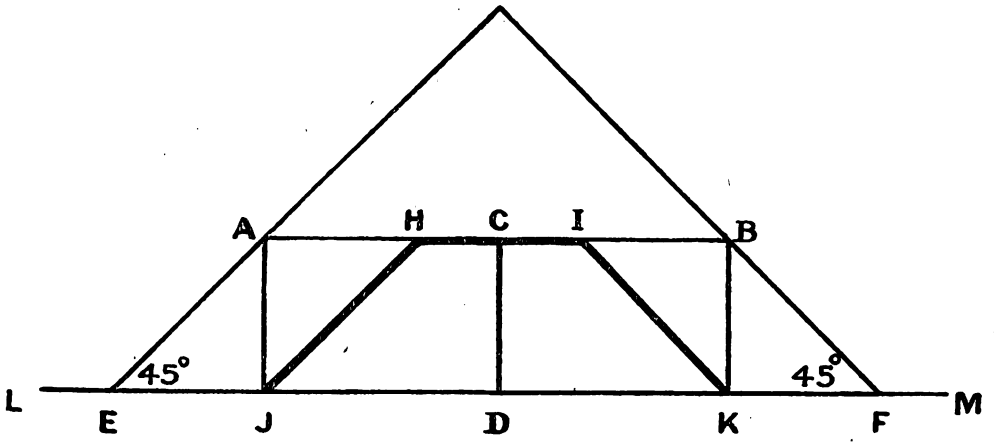

DIAGRAM 1

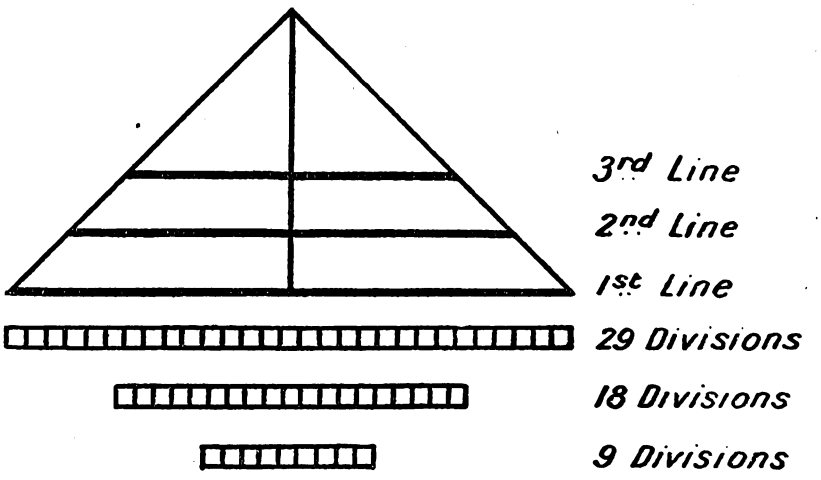

DIAGRAM 2

The number of infantry divisions required to effect a penetration against a strongly entrenched enemy holding three defensive lines of a depth of five miles, may theoretically be worked out as follows:—

There are three lines of trenches to be penetrated, each of which will require a separate line of divisions. The distance between each of these lines is two and a half miles. An infantry division had at this date a battle front of about 1500 yards in the initial attack, 2000 in the secondary attack, and 3000 in the tertiary.

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Consequently (see diagram 2), 29 divisions will be required to penetrate the line A B and 18 and 9 divisions to penetrate the lines C D and E F respectively. This gives us a total of 56 divisions.

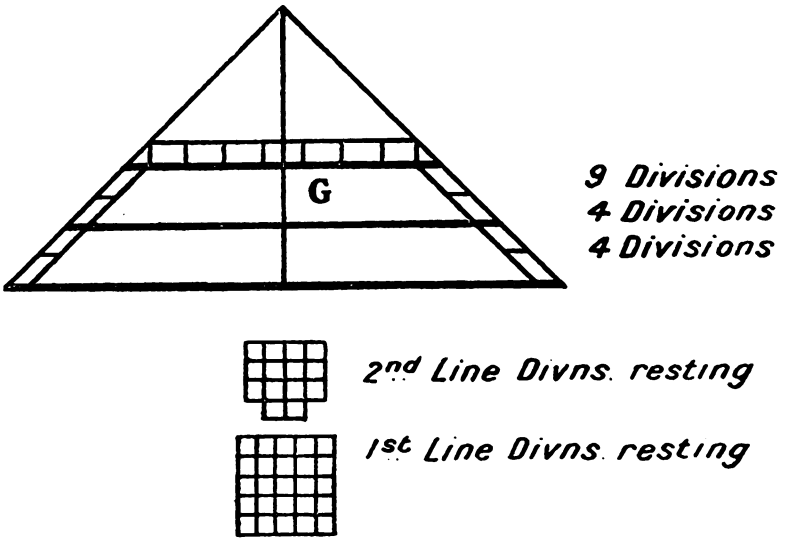

DIAGRAM 3

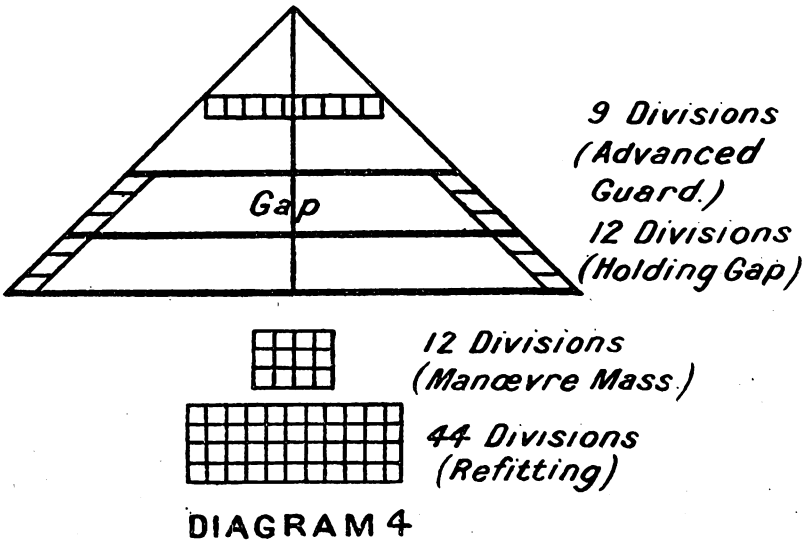

DIAGRAM 4

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After the initial attack, 25 divisions can be withdrawn to refit, and after the secondary attack—14; this means that, once the penetration has been effected, 39 divisions will be in potential reserve, and the remaining 17 will be holding the sides and apex of the hollow truncated cone (see diagram 3). The area G, which has a base of 15 miles, is practically shell free, and forms the manœuvre ground for the forces which are to pass through the gap. As the 39 divisions will take at least seven days to refit, they cannot be employed to pursue the enemy or to develop one or both of the flanks created; therefore, besides the 56 divisions for the penetration, a field army of at least 21 divisions will be required, nine of these divisions to act as a general advanced guard to cover the approach of the remaining 12 which will act as a manœuvre mass (see diagram 4), supported by the 39 divisions once these have refitted. The total divisions required is, therefore, 77, or 1,200,000 men. The supply of this prodigious force in the restricted area obtainable is manifestly more difficult, if not impossible, consequently, the result is that an attack of penetration against a determined and well entrenched enemy is normally unsuccessful.

I have entered into this detail on purpose to show the immense difficulties of attacks of penetration. The depth to be penetrated I have taken as being five miles, but, in 1916, many trench systems were deeper than this, and every hundred yards added to the depth meant thousands of more men added to the penetrating force. Operations of single penetration with artillery and infantry were not practical against deep and well held entrenched zones.

Tactical Theories at the end of 1916.

The battles of Verdun and the Somme proved to the hilt General Pétain's theory of attrition. Decision was never reached, because, as the penetrating forces bored their way slowly through the enemy's defences, new trenches were constructed behind them, and the whole front, except for the actual battlefield, provided the enemy with reserves.

The initial attack had generally proved successful, not only because of the preponderance of the attacking artillery, but because it was possible to launch this attack as a surprise. Once this surprise had been accomplished, the battle, as a moving action, was over, and the attack became a pure siege operation.

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In the main, the French considered that their theory of attack had proved itself effective, but that failure was due to an imperfect application of it. Objectives had become too limited, and the result was that the advance was slowed down to such an extent that the initiative passed over to the enemy in the form of counter-attacks. This resulted in the issue of the following instructions in December, 1916:—

(i) All attacks must be made on as wide a frontage as possible, otherwise distant objectives cannot be captured.

(ii) The object of the attack is the zone of the enemy's guns, consequently, artillery must be placed as close as possible to the attackers.

(iii) The attack will only succeed if each wave passes through the one in front of it without delay.

(iv) Full preparation must be made to push the exploiting forces rapidly forward.

The underlying idea was the same as in 1915, namely, "artillery conquers and infantry occupies," it was the occupation which these instructions attempted to speed up. Thus, more and more did it become apparent that the weak link in the attack was the infantry.

The Tactics of Dual Penetration.

Before I turn to the battles of 1917, I will examine the tactics of the dual penetration as this will render the spring operations of this year more intelligible. I have already pointed out the nature of the tactical salient Arras—Noyon—Reims, and that, in the autumn of 1915, a dual penetration was attempted by two simultaneous attacks, one from Artois and the other from Champagne. What does such a combined offensive entail? To answer this question we must return to our examination of battle salients.

Remembering what I have already written, the following still holds good, namely: if a penetration is to be effected, the salient created by the attack must be sufficiently extensive to prevent concentric fire being brought to bear on its central cone. But in a dual penetration we must add: if penetration is to be effected *between* two battle salients, then the axes of the two attacks must converge on the mean central line running at right angles to a line joining the centres of the two bases of operations (see diagrams 5 and 6).

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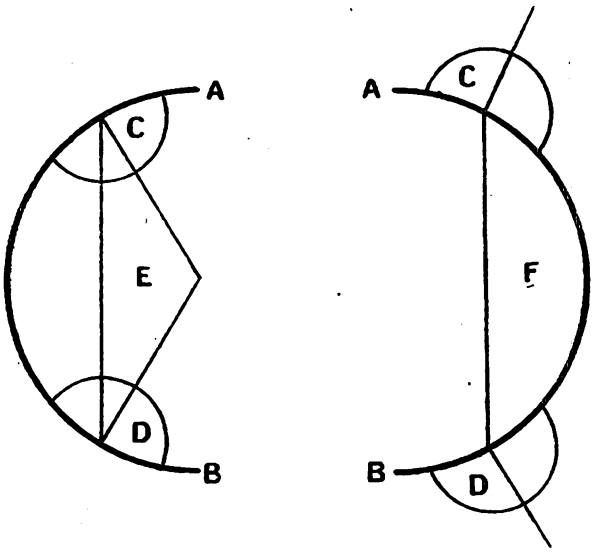
A glance at the diagrams will at once show that an enemy placed at E in diagram 5 is more precariously situated than one at F in diagram 6.



DIAGRAMS 5 & 6

As I have shown that an attack of penetration against one sector of the enemy's front is most difficult, I will now consider the dual attack, that is an attack against two closely related sectors of the enemy's front, made with a view to break the section which connects them. In such an attack, it is advantageous if a salient be chosen as the objective. For an operation of this nature three separate forces are required, as shown in diagram 7.* A attacks at D, not with a view to penetrate but to form a battle salient which will draw the enemy's reserves towards D. B attacks at E, to do likewise. Meanwhile a tactical penetration is being automatically effected in the area between the salients D and E, not only by the exhaustion of the enemy's reserve which can reinforce this intermediary sector should it be attacked, but by a squeezing of this sector into so pronounced a salient that concentric fire will render it untenable. The enemy holding it will normally be forced to evacuate it, thereupon C, following up his withdrawal, will effect

* I arrived at this conclusion towards the end of 1915. See "The Principles of War as applied to the Campaigns of 1914-1915" in the Journal of the Royal United Service Institution, February, 1916.

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a penetration under the protection of the two tactical bastions formed by A and B at D and E which prevent concentric fire being delivered against C's flanks.

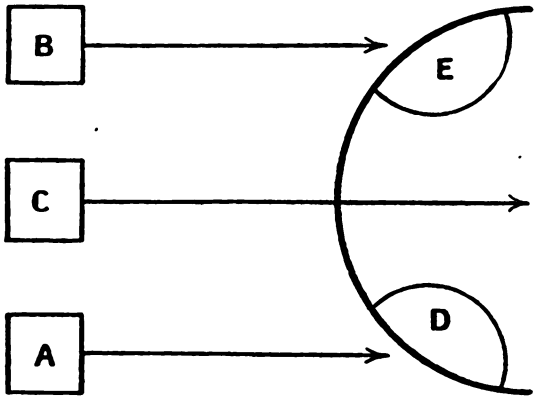

DIAGRAM 7

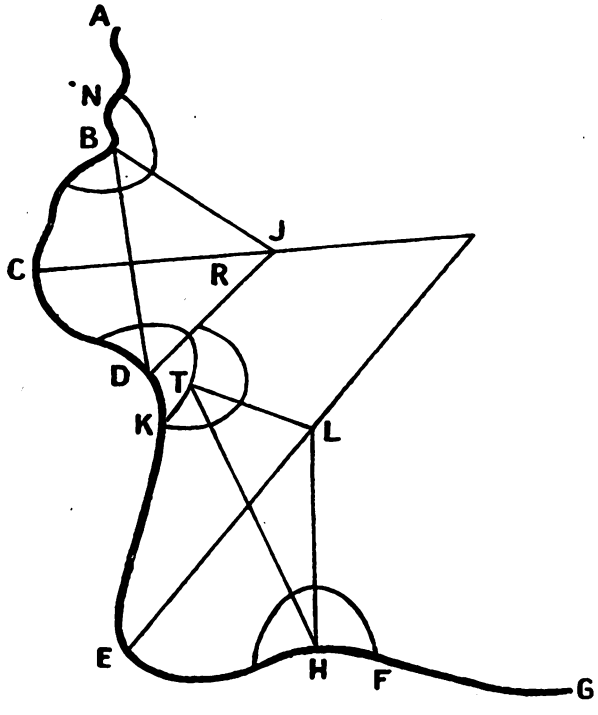

DIAGRAM 8

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In the above example the controlling factor is the distance between the centres of the battle salients to be formed. Frequently this distance is considerable, and when this is the case a quadruple attack may become necessary. Thus, in diagram 8, suppose A.G. represents the enemy's front, it is at once apparent, if a dual attack is to be made, that it should be directed against one of the salients A.E.G., K.E.F., or B.C.D. To cut off the first is difficult on account of the long intermediary sector between B and H. To cut off the second is dangerous, as an attack at K will jeopardise the attacker's left flank. To cut off the third is simple, and may be carried out on the lines already discussed. Suppose that this attack is successful, and that the enemy falls back to the line N.R.K., then the next series of attacks can be made from T and H, the penetration being effected along the line E.L., which, if it succeeds, will force the enemy to fall back from N.R. and so create a gap from N to F.

The Spring Offensive, 1917.

The spring offensive of 1917 is an exceptionally interesting operation, for immense experience in the attack of trenches had by now been accumulated, and the supply of ammunition was rapidly becoming unlimited. The battles of Verdun and the Somme had been fought to break the line at single places, now an attempt was to be made to revert to the Artois—Champagne tactics, and, by hitting at the enemy in one locality, compel him to draw his troops away from another at which the main blow was to fall.

In the project of these operations, the idea was to cut off the Arras—Noyon—Reims salient by two attacks; the first being delivered from Arras eastwards towards Valenciennes, and the second from Soissons—Reims northwards towards Mézières. Seven-eighths of the German forces on the Western Front were occupying this salient, and not an inconsiderable portion of this mass the smaller salient—Arras—Gommecourt—Morval, created by the Allied advance during the battle of the Somme.

The plan of attack against the Arras sector had been considered shortly before the opening of the battle of the Somme, then it had been dropped only to be revived again in October, and, from this time on to April, the most elaborate preparations were made to

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meet it. Then, in February, 1917, the Germans constructed an immensely strong line of entrenchments running from Neuville Vitasse, a little to the south-east of Arras, *via* Quéant and St. Quentin to about Craonne, known to the Allies as the Hindenburg Line. The whole tactical situation was now altered, for, when in February, the Germans retired to this line, the lesser salient Arras—Gommecourt—Morval disappeared; the nose of the greater salient was rounded off, and the country between the old and new German front lines was left a wilderness with every village flattened and every road blown. To strengthen the Arras front, the Germans built a rear line from Quéant to Drocourt, this was not completed at the time of the battle.

The idea behind the British plan was to pierce the German front line from Vimy to Croisilles, pass a great mass of cavalry through the gap and force the Drocourt—Quéant line. Success depended on penetrating the Drocourt—Quéant line within forty-eight hours of the initial attack, for otherwise the Germans would once again be able to draw in their reserves and block the gap. To effect this surprise it was, in my opinion, essential that the initial bombardment should be short and violent, nevertheless one of 15 days' duration was decided on in which 2,700,000 shells were fired. Thus, the battle was lost days before the attack was launched, for these tactics rendered surprise impossible.

The battle opened on April 9, and under cover of a magnificent rolling barrage the infantry penetrated to Monchy le Preux a depth of some 7,000 yards; then the battle to all intents and purposes ended, for though it was continued till May 4, little further progress was made, and when the operation closed down it had cost 155,000 casualties.

The French attack which was launched between Soissons and Reims on April 16, ended in a complete fiasco, in spite of the fact that to the artillery of the forces engaged was added 2000 heavy guns and 1500 trench pieces. The French attributed their failure to the dispersion of their artillery fire through selecting too many gun objectives; to the extensive use made by the Germans of wire on the reverse slopes of their positions, and to the total absence of surprise. This last reason was undoubtedly the most important, and as by now the German defensive zone was in many places ten

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miles deep, penetration by gun fire had virtually become impossible, the spade in fact had beaten the cannon.

Besides these reasons, neither we nor the French had grasped the true grand tactics of penetration. In this spring offensive, the two battlefields were no less than 80 miles apart as the crow flies, consequently they were too far distant to affect the intermediary sector. The Allies, as far as I am aware, had not grasped the crucial fact that the only way to effect a penetration was to force the retirement of the garrisons of this intermediary sector by two powerful flanking attacks. This was not attempted, instead—two *separate* acts of penetration were carried out simultaneously.

The last of the Great Artillery Battles.

In spite of uniform failure in all attempts to penetrate the enemy's defensive zone, G.H.Q. determined to carry out two more great operations, the first was the capture of the Messines ridge which was to constitute a stepping stone to the second: the penetration of the Ypres salient with a view to capturing the coast line and the inland submarine base at Bruges.

The first of these operations, the capture of the Messines—Wytschaete ridge, constituted a purely limited objective. The battle was begun on June 7 and ended in a great success, because the operation was a limited one. The second, which opened on July 31 and which dragged on to November 10, was from start to finish a colossal failure, and for the following reasons: First, Flanders is far more suited to defensive than to offensive operations, I have already called it a bastion; secondly, if the elaborate system of drainage which covers this entire area is rendered inoperative, the whole country rapidly reverts to its natural condition of a swamp. If troops were to advance over this country, the one essential was that as little damage as possible should be done to the surface of the ground. What happened? We assembled at Ypres the largest force of artillery ever seen in British history, the gunner personnel numbered no less than 120,000; we dumped at Ypres 321 400-ton train loads of ammunition and fired this off in a preliminary bombardment which lasted for 19 days. In this bombardment were fired 4,283,000 shells weighing 128,000 tons.

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The whole surface of the battlefield was torn up, all drains were destroyed as well as roads, and an all but uncrossable swamp was created in which the infantry wallowed for nearly five months. The ground gained was approximately 45 square miles, and each square mile cost us 8222 casualties.

Tactical Theory at the end of 1917.

General Pétain who, in May, had been promoted to the supreme command of the French Armies, had noted the great success of powerful and well mounted attacks on limited objectives, such as the battle of Messines, on June 7, and of Malmaison on October 23; he decided, therefore, for the time being to abandon any idea of gaining a decision, and in place to carry out a number of limited attacks on objectives which were vital to the Germans; each attack to be delivered as a surprise and to be closed down directly surprise began to wane.

On October 31 and December 20, instructions were issued to the French Army on offensive and defensive actions respectively. In the first of these the theory outlined was as follows:—

The entire front is to be divided into defensive and offensive sectors. The object is still to penetrate the enemy's front, but not at one selected point, but by so shaking the whole front that sooner or later one section of it will become so weak as to permit a successful frontal attack being made against it. This shaking process was to be effected by a series of violent yet limited attacks, or local punches, which would, by degrees, exhaust the enemy's endurance. Troops were to be rapidly concentrated, and attacks were to be rapidly mounted, delivered and broken off. The essential conditions were:—

(i) Minute preparation.
(ii) Superiority of force at the point of attack.
(iii) Surprise.
(iv) Rapidity of attack.

Roads were to be built, railways laid down, depôts and dumps formed all along the front, and special attacking forces trained which would move from one place to another, and find all ready for the punches they were to deliver. In these arrangements we see a return to the idea of mobility, which had been abandoned for

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so long; also to the idea of surprise, which had been obscured by shell bludgeoning, and to the idea of command which, during the great artillery battles, had been abdicated, for the Quartermaster General with his train loads of shells had entirely replaced in importance the Commander-in-Chief. These instructions were excellent, but they arrived too late, for two new weapons had crept over the horizon of the war, which were destined not only to introduce a new period, but a new epoch.

Von Hutier's Attack at Riga.

Whilst the Third Battle of Ypres was in progress, a remarkable attack was carried out by the Germans in the neighbourhood of Riga, which largely influenced the German grand tactics of 1918. General von Hutier selected a small sector of the Russian line, some 4600 yards in width, he massed against it a strong force of guns, one to every eight yards of front, and, on September 3, inundated it with gas shells and then attacked. The whole operation was over in a few hours and the success was complete, the reason being that he based his tactics not on the destruction of wire and trenches, but on the destruction of the Russian troops—infantry and gunners, opposed to him. This seems a very simple and commonsense idea, yet it was one which, on the Western Front, had been in the main lost sight of for three years. For three long and terrible years the Allied Armies had been hallucinated by material destruction. I will now turn to the second novel weapon.

The Battle of Cambrai.

On August 8, 1917, in order to relieve the pressure in the Ypres area, the Tank Corps suggested that a tank and dismounted cavalry raid should be carried out south of Cambrai between the Canal du Nord and the St. Quentin Canal. This area was chosen because the operation suggested was of a limited nature, and these two canals would automatically confine its margins. The ground was *not* chosen to fight a decisive battle on.

On October 20, G.H.Q. decided that the Third Army should prepare a tank and infantry attack south of Cambrai. The area selected was the same as suggested by the Tank Corps in August, but the object of the attack was now to penetrate the German

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trenches on a front of 13,000 yards, seize Cambrai, round up the Germans south of the river Sensée and west of the Canal du Nord, and exploit the success towards Valenciennes. The battle was, consequently, to be a *decisive* operation, and for such an operation two conditions were required: first, open unobstructed flanks so that the tanks could move outwards and rapidly widen the point penetrated, and secondly, that adequate reserves and supplies were assembled to move through the gap once it had been created.

It will be remembered that the sides of battle salients normally slope inwards at an angle of about 45 degrees. Above, I gave reasons for this; but with tanks all the difficulties mentioned can be overcome, and in place of the two defensive flanks, so necessary to protect the central cone of an artillery and infantry attack, two *offensive* flanks can be created, which as they are pushed outwards will add more and more room to manœuvre in in the centre.

The canals flanking the battlefield of Cambrai prohibited this extension outwards, further, as the St. Quentin Canal took a sharp bend westwards at Crèvecœur, unless tanks could cross the canal at Masnières, the battle front would be narrowed down to 8,000 yards, that is from Marcoing to the Canal du Nord.

Because of these limitations, the Tank Corps suggested that two thirds of the tanks should be concentrated *on the left of the line Marcoing—Villers-Plouich* and organised into two echelons; the first to break throngh the Hindenburg line on the 20th, and the second to be held in reserve and pushed through the gap on the 21st. This suggestion was not listened to, and in place all the fighting machines, 378 in number, were distributed in approximately equal strength down the fronts. This most faulty distribution virtually limited the attack to a one day's operation.

The attack, on November 20, was a remarkable local success, a penetration of 10,000 yards was effected, without any preliminary bombardment. At Ypres, 120,000 gunners entirely failed to accomplish what in this battle was done by 4,000 tank soldiers, and on the 20th, 8000 prisoners and 100 guns were captured, and our own casualties were about 5000 and not 40,000 as on the first day of the battle of the Somme.

The success was, however, short lived, and for the following reasons:—

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(i) No reserve of tanks existed for the second day's operations.
(ii) Totally inadequate reserves were at hand to exploit.
(iii) Cambrai, being a great railway centre, enabled the Germans rapidly to assemble reinforcements.
(iv) The two canals checkmated any attempt to move the tanks outwards and so secure the battle flanks by offensive expansion.

Under cover of the St. Quentin canal, the Germans assembled large forces, and, on November 30, launched a counter-attack which regained much of the ground they had lost.

The Lessons of Riga and Cambrai.

The secret of the successes at Riga and Cambrai was surprise. This lesson was appreciated by the Germans and the French, but only partially so by ourselves. In both these battles, the front of attack had been kept a close secret. At Riga, von Hutier had selected a wooded region which prevented the Russians ascertaining what he was doing; at Cambrai all preliminary movements took place at night, and the foggy weather greatly assisted the secret assembly of troops.

The main lessons learnt, or which should have been learnt, from these two remarkable operations were:—

(i) To maintain secrecy, extensive use must be made of camouflage; no movements must take place by day and any increase in fires must be avoided.
(ii) To attain surprise, no preliminary registration of guns or bombardment must be allowed, and no new trenches must be dug.
(iii) To prevent leakage of information, the troops who are to carry out the attack must be kept well in rear until the attack is imminent, and they must be trained for the operation.
(iv) To obtain continuity of movement, strong reserves must be ready in hand to replace the initial attackers directly they are exhausted.

Thus, at length, thanks to two new inventions— the gas shell and the tank, surprise as the grand tactical act of battle was reinstated. I will now trace its evolution during 1918.

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The German Spring Offensive, 1918.

The German spring offensive which opened on March 21 was based on the tactics made use of by von Hutier at Riga. The front selected ran from about Lens to La Fère, and was some 74 miles in extent. Sixty-two divisions were to be employed on this front which, except for a few miles, was held by the Third and Fifth British Armies whose respective strengths were 17 and 14 divisions, exactly half the attacking force. Though the Germans intended to attack the whole of this front, the main effort was to be made north of St. Quentin at the point of junction between the British right and French left. In this area was assembled an enormous mass of guns, one to every eight yards of front, and on March 21 after a short but violent bombardment of gas shells the infantry assault was launched. By the evening of March 22 a penetration of about ten miles was effected and by the 31 Montdidier was reached.

The initial success had been great, but the penetration which had been effected was only 38 miles, or approximately half the original base of 74 miles. The failure of the battle was due to well ascertainable causes, the two most important being the comparative narrowness of the front when compared to the depth of penetration required in order to obtain a decisive result, and the insuperable difficulty of keeping an advancing front of many divisions supplied. The German front of attack, as I have said, was about 74 miles, and by April 4 the depth of the penetration effected was some 38 miles. Consequently, if it was necessary to reach Abbeville, which is about 60 miles from the original German front, in order to effect a separation of the British and French forces, the initial front of attack should have been at least 120 miles in width. Though the German forces were insufficient to attack on such a frontage, had they been sufficient the second factor, namely difficulty of supply, would in all probability have wrecked their plan. We thus see that any attempt on the part of the Germans to win the war by an immense frontal attack before the Americans could develop their strength, was, as long as the Allies resisted stubbornly, virtually an impossible operation. This by April 4 was realised by the German Higher Command, for the battle on the Amiens—Noyon front was closed down save for minor operations south of La Fère, and other fronts of attacks were sought, namely those

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west of Lille, south of Laon, and north of Compiègne, which were attacked respectively on April 9, May 27 and June 9.

In the attacks of April 9 and May 27 great quantities of gas shells were again used, and the fronts between Festubert and Fleurbaix, and Soissons and Reims were rapidly overrun; but once the depth of penetration had roughly equalled half the length of the base of attack they died out.

From the grand tactical point of view these three battles were a failure, the reason being that, though penetration by surprise could now be effected against any weak point in the enemy's line, movement could not be maintained because supply could not keep pace with the attack and the attackers themselves could not be reinforced sufficiently rapidly. This being so, and it undoubtedly was so, it is interesting to find that this point was entirely overlooked. Surprise had been so long obscured by shell-bludgeoning that, now it was rediscovered, all sides were so pleased that they could not refrain from repeating it, it was a new toy just as the rolling barrage had been.

The Germans had effected three of the most extensive advances of the war by means of surprise, therefore the secret was surprise; but it was overlooked that, whilst this was so, each of these great attacks had "petered out" because they could not be supplied. Surprise, it was forgotten, is only a tactical means towards victory, it is not an end in itself, but a means towards an end. The secret of penetration was now common property, but the secret of exploiting a penetration was still a sealed letter, and only at the very end of the war was any attempt made to break the seals.

In July, another set of instructions were issued to the French Army and in these we read:—

Attacks must be prepared with "le maximum de secret" and launched with "le maximum de surprise," and as often as possible without artillery preparation but by tanks. Exploitation will be immediate and distant in order "to ensure continuity of effort and to prevent the enemy pulling himself together."

All this is excellent advice, but surprise alone will not attain it, surprise will not fill men's stomachs with food, it will not rest their legs or replenish their empty pouches and their gun limbers. Penetration requires surprise; exploitation, or pursuit, requires

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continuity of movement. During 1915, 1916 and most of 1917, the Commander-in-Chief had been replaced by the Quartermaster General; by the middle of 1918, the Commander-in-Chief, in the person of General Foch, had come back to his own, and the Quartermaster General was forgotten. Yet to answer the supreme tactical question of the war; what happens when the gap is formed, is far more a Quartermaster General's problem than anyone else's; this was not understood in July, 1918, it was overlooked just as surprise had been.

The Franco-British Summer Offensives.

In examining the Franco-British summer and autumn offensives, the reader should for a moment turn back to the tactics of the dual penetration, and then examine diagram 9 which shows a rough outline of the Western Front from Ypres to Reims. This front is made up of three salients formed by the three German attacks—the Merville salient, the Amiens salient and the Château-Thierry salient. As regards the Merville salient, though an operation was contemplated against it, it was abandoned as the country was not suitable for a tank offensive. As regards the Amiens salient, it offered a superb opportunity of effecting a dual penetration on the lines I have outlined: one force striking from Amiens and the Somme eastwards, and another a little west of Soissons northwards, the axes of these attacks intersecting at Péronne. The result of such a dual attack, carried out with tanks, would cause the whole front from the Somme to Soissons to cave in and would effect a penetration of no less than 45 miles. As regards the Reims salient, as enormous numbers of Germans were occupying it, a dual attack, one from west of Soissons and the other from Reims converging on Fismes was likely to result in a veritable débâcle. This attack was also considered, and had there been sufficient tanks in the French and British armies, quite possibly two dual attacks would have been attempted simultaneously, one against the Amiens salient and one against that of Château-Thierry. Had these attacks succeeded, a gap of 80 miles would have been made in the German front.

Whilst these various plans were being considered at the Allied Headquarters, on July 15, the Germans launched their last

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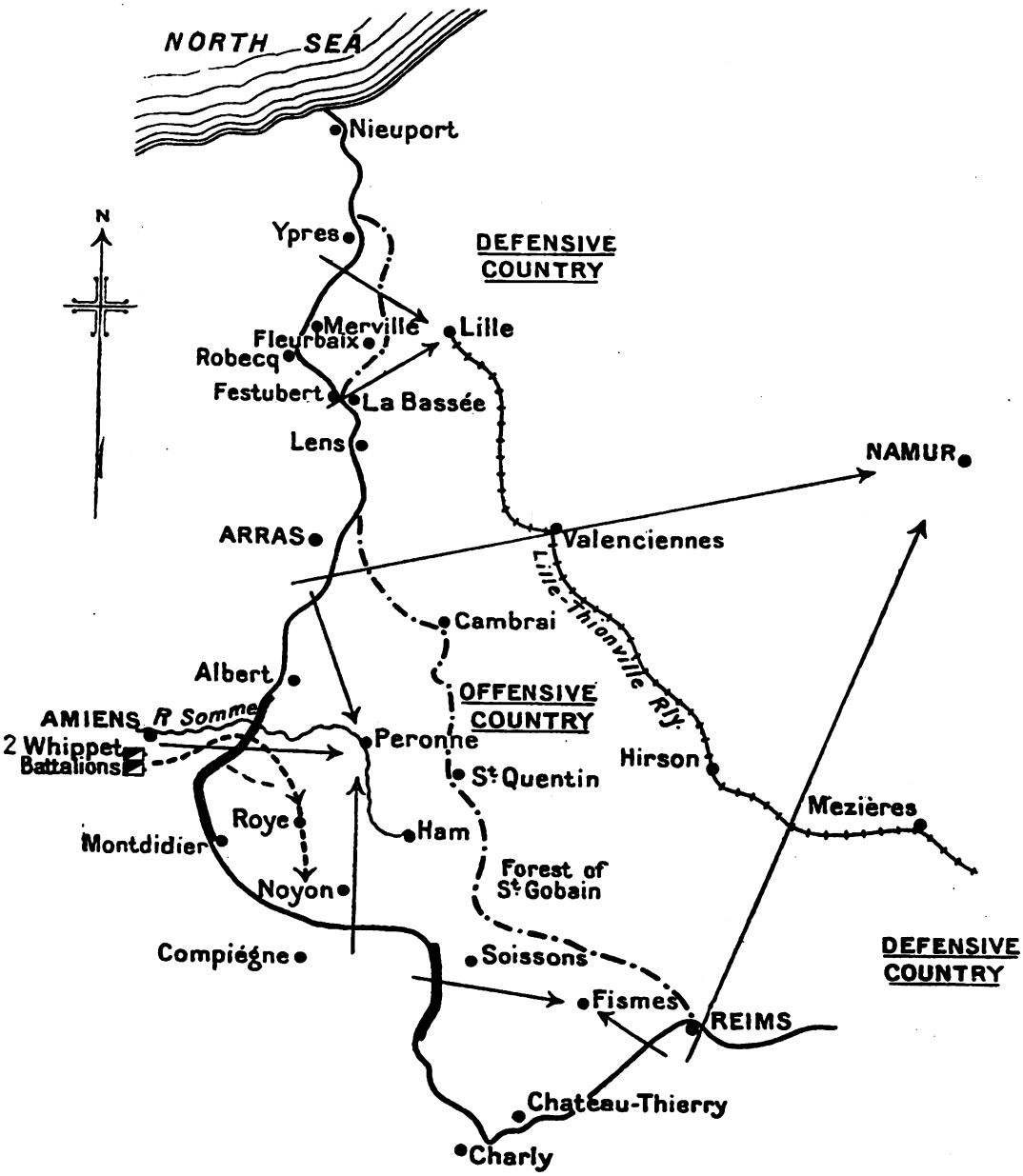

DIAGRAM 9

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offensive in Champagne. The French having reverted to the pre-war idea of the outpost line, the German attackers fell through a paper partition and were met, on the 18th, by a formidable counter-attack delivered against the western flank of the salient and preceded by 225 Renault tanks. Thus opens the Second Battle of the Marne and it is continued to August 7.

The result was that the Château-Thierry salient vanished and that the French tank units were too exhausted to withdraw, refit and re-engage against the Amiens salient, against the apex of which an attack was delivered on August 8. Into the nature of this attack I will now enquire.

The ideal operation would have been to deliver one attack from Arras south-eastwards, and the other from a little east of Compiègne northwards, the axes of which would converge on Péronne; but the main reasons which rendered this operation a difficult one were: the valley of the River Somme cut the salient in half; the old Somme battlefield was bad offensive country being furrowed by hundreds of old trenches, besides communications across it were very few and bad; lastly the French had temporarily exhausted their tank units. The next most promising operation was a dual attack from Amiens eastwards and from Compiègne northwards. This may have been considered, but, if so, it was laid aside and replaced by a Franco-British attack extending from a little north of the Somme to Montdidier.

The British attack was first of all looked upon as a local operation, the objective being limited to the recapture of the old Amiens defence line. At a Conference held at the Fourth British Army Headquarters on July 21, it was decided, however, to extend it to the Somme from Péronne southwards. The tactics to be employed were to be based on tanks: nine battalions were to lead the attack, one was to be kept in reserve and two whippet battalions were alloted to the cavalry who were to carry out the exploitation.

The Tank Corps representative attending this conference considered the tank reserves inadequate, and suggested that as the French First Army, operating on the right of the British Fourth Army, had no tanks, the two battalions of whippet tanks (96 machines in all) should not be tied down to operate with the cavalry, but should independently move forward directly a gap

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was created, and by advancing on Roye (see diagram 9), attack the rear of the Germans facing the French First Army. This suggestion, however, could not be met, consequently the attack became a frontal one.

The result of the great battle, on August 8, is well known; The Germans were decisively defeated, and Ludendorff christened this day "the black day of the German Army." On the 11th, the British offensive ended and was reopened north of the river Somme on the 21st. From now onwards attack follows attack, but all are of short duration and there is no pursuit because advancing troops cannot be adequately supplied. In all these battles the same difficulty confronted the Allies which, earlier in the year, confronted the Germans, namely, the maintenance of battle energy by supply and reinforcements. The war ended before this problem was solved, but, had it continued for another six to twelve months, I fancy a solution would have been found as this problem was being carefully considered.

In this last great campaign of the war, what do we see from the grand tactical point of view? We see, amongst many things, three outstanding factors: ground, grand tactical formation and the influence of communications. I will briefly consider these.

It will be remembered that the zone of the Franco-Belgian frontier can be divided into two defensive areas, or bastions—Flanders and the Ardennes, and that between these lies the good offensive area of Hainault, which extends south-westwards towards Paris. Where, in 1914, did the Germans advance most rapidly? In this offensive area, and because they did so, when they were halted, the grand tactical formation of the front became a salient Arras—Noyon—Reims, flanked by the two bastions. In rear of this salient ran the great railway from Thionville to Lille.

In March, 1918, where did the Germans attack? They attacked in this same good offensive area. And, when the French and British counter-attacked, what area of operations did they select? This very one. What points did they strike at? Valenciennes and Mézières, and when they reached them the great Thionville—Lille railway was cut and the Germans asked for an armistice.

What does this teach us grand-tactically? That the Allied offensives against the bastions—Ypres and Verdun, were misjudged;

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that there was but one area in this part of the Western Front in which offensives should only have been attempted, namely, the triangle of good offensive country between Arras, Reims and Namur (see diagram 9), and that consequently, all offensive operations from start to finish should have been restricted to this area; the tactical operation being the dual penetration from Arras and Reims, and the strategical objective being the cutting of the Thionville—Lille railway at Valenciennes and Mézières. Could not this have been appreciated in November, 1914?

The Project for 1919.

To round off the development of the tactics of penetration on the Western Front, it is necessary to consider what was intended had the war been prolonged into 1919.

The problem was no longer how to break the enemy's front, the tank had solved this difficulty, but instead how to maintain continuity of forward movement, in other words, how to effect an unbroken pursuit. As long as the enemy was only punched back, and after each blow was given time to recover, he could always find time to destroy communications—roads and railways, before he withdrew. Without roads and railways the pursuit of a determined enemy was not possible. Two suggestions were put forward, the first on May 24, 1918, and the second a few weeks later.

The first was, by means of fast moving tanks to strike at the enemy's system of command and supply, as well as drive a hole through his front. This operation was to be carried out as follows:—

(i) A force of fast moving machines, under cover of darkness or smoke, was to rush through the enemy's front and attack his divisional, corps and army headquarters as well as his railheads and supply centres.

(ii) Simultaneously the normal tank, artillery and infantry attack was to be made on the troops in front of these headquarters.

It was considered that if these two attacks, one on the enemy's brain and stomach and one on his body, could be successfully carried out on a frontage of 50 miles or more, such demoralisation and disorganisation would result that the enemy would not be able

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to effect an orderly retreat, and that, consequently, communications would be left intact.

The second suggestion was purely an administrative one—the supply of the pursuing force, which it was maintained could be solved by means of cross-country supply tractors.

The upshot of these suggestions were that orders were placed for 6000 to 8000 tanks and 10,000 supply tractors, the bulk of which would have been ready by the early summer of 1919.

As regards the first suggestion, it is interesting to note that a somewhat similar operation was carried out before the war ended. At the battle of Megiddo, which began on September 19, once the British guns had blown a hole in the Turkish line, large forces of cavalry were passed through. These falling on the Turkish headquarters and communications created such disorder and demoralisation that the whole Turkish front fell to pieces, and within a fortnight Damascus was occupied.

Conclusions.

Looking back on the tactics of the Great War and the tactical doctrines which were held by all armies before its outbreak, the lack of coincidence between the two is not only remarkable but instructive. Since 1871 the great military nations of Europe had been engaged in studying the past to the exclusion of the future, consequently the conditions in which the next war was to be fought were not grasped, consequently all sides were surprised, not so much by each other's craft as by their own lack of foresight. If this were not bad enough, when towards the end of 1914 the war had disclosed its static nature, so little was understood of the science and art of war that even then, when it was obvious to all that penetration must be the prelude to the reinstatement of mobility, seldom do we find any one of the General Staffs attempting to make use of existing conditions, especially topographical ones, to assist in breaking the enemy's front. As I have pointed out, the triangle of country lying roughly between Namur, Arras and Reims was the only area in which penetration could be effected by offensive action with any hope of economy. Further, it was hopeless even in this area to attempt penetration at any one point or even at any two points unless they were sufficiently close together to influence

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detrimentally the area in between them. It was never grasped, so far as I am aware, that the point of penetration was not to be sought at the point of attack, but between two converging points of attack. It was never understood that if a line 400 miles long was to be broken, the front of attack must be at least 100 miles, and that the decisive attack should only be launched after the enemy's reserves have been exhausted. It was not realised that troops did not exist in sufficient numbers for such an extended attack, and even if they had they could not have been supplied. Lastly, the obsession of method, of numbers and of brute force prohibited surprise, the true forerunner of victory.

The possibility of carrying out an effective dual attack of penetration was, I maintain, a feasible operation in 1915, for though shell shortage existed trench systems were still shallow. With armies as then organised it was, I maintain, more feasible to do so than with the armies which existed in 1916, and most of 1917. It was not lack of fighting force which created the stalemate, but lack of knowing how to apply it correctly. Had this not been so there would have been no need to have carried the war to Gallipoli, to Mesopotamia, to Palestine and Salonika, all impossible decisive theatres. Lack of military imagination dispersed our fighting force, at a time when sanity demanded the concentration of every man and gun on the Arras—Reims front.

Later on we come to Riga and Cambrai, true battles of penetration based on surprise. Do we find wisdom resulting from them? No, only another obsession, namely penetration itself—the tool is mistaken for the hand. If I am wrong, why then the gigantic single attacks of 1918? The German offensives were single, one following the other and each aimed at a weak point. The French and British attacks are single; the value of salients is not understood, neither is the problem of supplying a moving army understood. Yet lethal gas and the tank were weapons pre-eminently suited to the dual attack, since gas could create defensive flanks by rendering areas uncrossable, and tanks could form offensive flanks and strike at the rear of the enemy, the enemy between the two points attacked. Have we learnt this lesson yet? I much doubt it. Have we learnt, that the decisive point of attack is the rear of the enemy's army, and that to hit this rear we

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want two forces, just as a boxer wants two fists; that all attacks should when possible be dual in nature, since it is more difficult then to gauge which force is going to hit out decisively. A boxer watches his adversary's fists, and it is more difficult to watch two fists than one fist, because whilst the right one is being watched the left may suddenly hit out. Do we understaand this problem; if we do not, then the supreme tactical lesson of the war remains unlearnt, whether we intend to penetrate, envelop, or hit in rear. Two fists, a body in reserve, and one brain, such is the tactical organisation which the solution of this problem demands.

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OBSERVATION.

By Col. A. G. Arbuthnot, c.m.g., d.s.o.

(i) "No predicted shooting or firing with observation from the air should be resorted to if fire can be efficiently directed by means of observation from the ground." (A.T., Vol. III, § 24.)

(ii) "Regular instruction . . . . gradually educates men to make an intelligent use of their eyes until an automatic connection is established between the eye and the brain, and sight becomes observation." (A.T., Vol. I, § 252.)

ARTILLERY Training, Vol. III, teems with references to the importance of ground observation; it is described as of "paramount importance" and as the "first consideration." These references were written while the war was still fresh in our memories, written by officers who spent the first eighteen months of the war at battery observation posts, who remembered well their value and the trouble taken to obtain the very best. During those early days of shell shortage the "O.P." was at the height of its valuation; as shell increased, alas! depreciation insidiously crept in, till in 1917, during the long drawn out struggle of the third battle of Ypres, observation perhaps reached its lowest ebb; Army and Corps exhortations for the first time became necessary, and there is no doubt that many brigades and batteries had lost the desire to compete for the possession of the best "O.P.", and the gunner no longer supplied the greater part of the corps information.

It is easy to understand how observation deteriorated in 1916 and 1917; the "O.P" too often had to be handed over to young and inexperienced officers who were convinced that there was nothing to see, and this was seldom true. The batteries in 1917 were tried to the limits of human endurance, and the large amount of available ammunition was nearly all used for divisional and corps "area shoots," test barrages, and night harassing fire. There was no incentive to observation because there was little, if any, ammuni-

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tion left to the battery commander, and moreover the physical limits of officers and men were already overtaxed by night work, perpetual gassing, and digging out of buried guns, men, and ammunition. About 40 batteries passed through my group during the latter part of the series of Paschendaele battles, and they naturally varied considerably in morale and efficiency; many of them had already had one recent tour of the salient, during which they had lost 150% of their gun line and no few drivers. I soon found the two best tests of their efficiency and offensive spirit were, first, their attitude towards observation, and secondly the percentage of guns they contrived to keep in action. One brigade of the 32nd Division, I remember, caused heated correspondence with Corps R.A. by returning a weekly average of 6·5 guns per battery in action! By surreptitious searchings of salvage dumps and abandoned positions they managed to maintain a reserve of guns in action, in addition to the customary four or five at the mobile repair workshops. We still maintained our lead of the "Bosch" however, for at this period the latter had practically given up observation, and a brigade in the open was often less shelled than those crowded in hollows like the "Steenbeek."

As 1918 progressed observation improved, and after the barrage stage of an attack was over, there was a genuine desire to get well forward and find good "O.P's"; but far too many of our battery commanders had no recollections of 1914 and 1915, and their experience was dulled by years of trench warfare. As shortage of cartridges when after big game is a great incentive to good stalking and accurate shooting, so shortage of ammunition was no mean instructor in the art of keen observation and hitting with the first burst of fire. Nothing that I can say in this article can give a true picture of what our batteries managed to do during the first year of the war, with scarcely any ammunition, by means of intensive ground observation. Some batteries, whose commanders had learned to see where nothing was visible to the ordinary eye, carried on the work all through the years; but they were far too few; one met them in all theatres of the war, they provided half the intelligence summary, they accounted for half the enemy's odd casualties, they located half his batteries, they encumbered the

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ground with their "borrowed" telephone wires, nipped his counter-attack in the bud before our infantry knew it was threatening, and lowered his morale more than anything else. What an asset they were to a brigade or division ! but they were seldom believed in by the average blind. Do not let us forget those batteries and their moving spirits now in peace time, but rather remember that that sort of shooting represents more than 50% of the work of a battery in the encounter battle, has an almost uncanny moral effect on the enemy, and produces our most efficient and offensive batteries. Let the remaining 50% of work partake of the nature of the greatest available concentrations of fire on the smallest essential fronts; between the two lies waste of ammunition.

Instances of the moral and material value of a man who could see at a good "O.P.", I could give without number, but space forbids, and I have only said what I have because I am conscious of a tendency in the air to belittle observed shooting, and to think that its day is past; because we are obsessed with our other very necessary methods of shooting; because there are too few of us left who know what "value for shell" a battery with a good observer gave during all periods of the war. It is true our Artillery Training is quite emphatic on the subject; but there is no "look out" man on the regulation battery staff now, and he would appear, untrained, on the second day of battle; it is true it is still considered somewhat of a heresy to decry observed shooting, but the fact remains that this heresy exists pretty freely, and I fear sooner or later if we do not encourage observation, we shall lose the art.

There are many who pass the subject over lightly under the impression that if you put an average officer or man on a hill where there is some sort of view, he can do justice to a battery, and that that constitutes "observed shooting"; similarly there are some who believe a man can groom a horse, set a saw, or get the best use out of a telescope, by the light of nature without training or practice. Others believe that on a modern battlefield there will be nothing to see; regretfully I must include these among the "blind," for there is always something to see for those whose eyes are trained. I want to put before you "Observation" in the widest sense of the word, as an Art which some few possess by instinct, but which is highly amenable to training and practice, and I ask

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those who are sceptical to follow me in my endeavour to prove that it is worth our while to encourage the art. That half the value of artillery observation lies in the information it produces for the division and the corps should alone be sufficient to emphasize its importance at a time when information is a very weak link in our armour.

To hark back to the war, let us ask ourselves who were the men whose eyes could "see"? We can all remember some here some there; my own recollections are probably similar to others, but I took particular interest in the subject, was always on the look-out for the born observer, and always endeavouring to encourage others in whom the faculty was latent but undeveloped. This must be my excuse for giving personal impressions. The British Army one might naturally expect would shine in the matter of observation and information; we had seen far more of the world, we were a sport-loving nation, and most of our officers had had the advantages drawn from hunting and shooting and travel; we had learned some bitter lessons on the value of eyes in South Africa, and on the Indian frontier, and I honestly think we were better than our enemies and allies. Nevertheless, as a whole, I consider our army was very blind.

Now to the exceptions; to me it was ever a delight to find them. What manner of men were they? and to what must we attribute their powers?—for they undoubtedly possessed powers that marked them out from other men. Among our regular officers I noted the big-game hunter and the Indian pigsticker stood out somewhat clearly. I recall a lively reconnaissance of our very indefinite front line before an attack at Ypres in 1917; I was accompanying three senior officers, all noted pigstickers; there was nothing that their eyes missed, and the lie of the land was an open book to them; one was our greatest exponent of pigsticking in the regiment, another an Indian Cavalry officer commanding an infantry brigade. The average hunting man did not in my experience show up as well as might be expected. Then I have vivid recollections elsewhere of Lovat's Scouts, and the Scottish Border Horse; I would have liked to have inveigled them all into the gunners! they were wonderful but rather wasted.

The artillery were lucky in 1915 in getting a large proportion

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of officers drawn from all over the world, from Canada, the Argentine, Japan and Malaya, etc., men who threw up their jobs and hurried home at the first rumour of war, without waiting to be called; many of these possessed to a marked degree certain great qualities; enterprise, command of men, and power of observation; the percentage of "blinds" was very small compared with the young New Army officers from England. Then again, in the front line, the gunner soon got to know the few officers and N.C.O's from whom he could always expect useful and accurate information; among them the machine gunner was usually his best draw. All of these men owed their powers to the life they were born to or the life they chose; they all probably inherited some love of the wild, and a dislike for towns and cramped spaces. We cannot all be Scottish gillies or South American ranchers, or big game hunters, but many of us have the same instincts without the opportunities, and these are the officers and men whom we should encourage and train to use their eyes, and their glasses and telescopes.

If this is a fair picture of how things stood during the war, in peace the situation is far worse; at our practice camps we are absorbed in gunnery problems, with occasional tactical interludes, but "observation" in its larger sense is dead, and the term is usually only applied to spotting the fall of shell. On manœuvres the opportunity does exist, but no day passes without glaring instances of things not seen that should have been seen, small things, but often important; we think all our information about the enemy is due to come from the air, but this was not the case in the Great War, and will not be so in the next war. We now have our infantry liaison and intelligence personnel who keep the division well informed of our own movements; we have our gunner "O.P's" stretched across our front, but they do not give us the information about the enemy, and about our most forward troops, that they should and could. I recollect, in 1915, the first news that reached corps headquarters of the move of large German forces away from the Ypres salient came from a certain Bombr. Cook; when this man first began work at an "O.P." he was stone blind, but he developed into one of the keenest and most reliable observers I have ever met. A glaring instance of lack of respect for ground observation is fresh in my mind from the 1925 manœuvres. An advanced

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guard had reached its objective unopposed and was holding some high ground with one battalion; there were still no signs of opposition, so the gunner was kept behind at battalion headquarters "because the guns were not yet wanted." As if anything could excuse a gunner not manning a vantage point! from our outpost line lay a view over half a county. During a period of over an hour the advance of three separate enemy battalions was visible, not obvious, but no skilled observer could have failed to spot them and follow their re-appearances as they passed partially exposed places. The only man who saw them was a machine gun corporal who turned his gun on to the last battalion at 3500 yards; but the information got no further!

To give one more recent example of lack of "eyes," last summer I saw a squadron of R.A. Mounted Rifles riding along a grassy lane; they had a patrol in front of them and an armoured car behind. Suddenly a herd of cattle, grazing on the crest 600 or 700 yards ahead of them, threw up their heads, closed to the side of the field, and then stampeded wildly; obviously terrified by something beyond. The patrol and squadron rode on happily. A minute later an enemy armoured car topped the crest, halted, raked the helpless squadron with its machine guns, and departed. Had that patrol been trained they would have noticed the action of the cattle; a little more training and they would have known that nothing but a lion, a tank, or a very ugly armoured car, could cause cattle to behave like that! and the squadron would have had time to get out of the lane and send forward their own armoured car.

Instances of success and failure of observation during the war were of course innumerable, but here and there examples stand out where power of observation has saved the situation; I witnessed one such in 1916 in Macedonia. Two very weak battalions were hanging on to a line of trenches on the near slope of a ridge which they had raided the previous night, and hoped to hold for 24 hours; they had suffered very heavily all day from enfilade fire, their position was quite untenable, and they had been told they could withdraw when possible; behind them lay a "no man's land" of nearly 1000 yards of open valley, fully commanded by the enemy trenches they were in, so to withrdraw before dark seemed impossible. All wires were cut, and visual signalling very interrupted.

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Suddenly, without any warning, a gunner "O.P." on the right saw the men of the right battalion begin to trickle back through the scrub; almost simultaneously the group "O.P." detected the spikes of a long line of German helmets along the ridge a bare 60 yards from our men. A German battalion was lying down just over the crest awaiting the order to charge, but invisible to our infantry; nothing but the keenest observation could have detected them, as literally only their spikes and an odd helmet top were visible. The ridge had been divided into zones, the ranges and lines were well known, and without waiting for our men to be clear of the trenches the fire of five or six batteries was instantly brought down on the crest. As the first line of low shrapnel spread almost simultaneously from right to left, the Germans came into full view along the whole ridge—and were simply swept off it.

Our infantry made good their withdrawal without another casualty; the enemy, in spite of very gallant and repeated attempts, failed to get a live man into the vacated trenches, and left the ridge and communication trenches heaped with their dead. Now this was a question of seconds; the batteries were marvellously quick it is true, but they had been similarly called upon several times to repel counter attacks from the flanks. The chief point is that nothing but the most intense and continuous "look out" by trained observers would have spotted the very commencement of our withdrawal and only an expert would have made out the odd spikes and occasional helmet tops along the crest. With any but skilled observers our curtain of fire would have been a minute or so too late; observation of the keenest order turned the scale between a disaster and a successful withdrawal.

Let us now consider how we can improve our observation in peace without waiting to learn by the bitter experience and training of war. First we must eradicate the fallacy that a man with normal eyesight sees things—he does not, unless his powers are trained by circumstances or by design; no more than a man with legs can run a good mile, or a man with arms do a long arm balance. Next we must get encouragement from above, and initiative from below. We have to deal with men largely drawn from industrial towns whose eyes and powers have been stunted by confined spaces, and whose whole interest is centred in beings and houses and things

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within ten yards of their faces. Naturally in open country they are blind as new born puppies! Our young officers have better opportunities, but they, too, are suffering from over civilised, over populated, surroundings, and moreover the motor car and cycle, which have ousted walking, riding and driving, are distinctly adverse factors. Hunting is good, but there are too many who derive but little benefit. Too many who carry no mental picture of the line they have ridden after a good hunt; too many who go home, or back to a car, by devious ways on the bad information obtained from local inhabitants, carrying no map in their pockets, and no extract of the map in their brain; an eye for wire is becoming of more consideration than an eye for country. Yet many of these men and most of these officers have the latent inherited powers of observation in them, only waiting to be developed by life or training; just as many a fine civilian soldier in the war threw back hundreds of years to some old fighting ancestor.

That it is possible greatly to develop powers of observation in peace time, even in England, I am convinced; and I am equally certain that it is well worth while to have four or five men in every battery and company specially trained to use their eyes and wits. Several years before the war, when adjutant of a brigade in India, I got permission, as an experiment, to train a class of men in observation with a view to providing battery "look-out" men and patrols. I asked each battery to send me two young N.C.O's with good education certificates, and two of their keenest "Shikaris," who habitually spent their week-ends in the jungle. I think Rudyard Kipling's "Kim" was the basis of a good deal of our training; we practised turning sight into observation and memory, indoors, like Kim, with coloured stones and small objects, and outside during cross country rides and reconnaissances. We used to camp out for week-ends, practised the men in obtaining information and provisions from native villages without causing alarm, taught them to stalk black buck, to note and recognise all tracks and deduce the story of the morning's comings and goings. Each week we carried out a test, taking the men to some rising ground, or halting them unexpectedly after a ride of a mile or two, and making them write down under certain headings as many things as their eyes had noticed and their brains retained. Once the ice

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was broken the very marked progress week by week astonished me, and led me to devise further methods and tests and reduce the results to mathematical percentages. Some men of course had to be returned or exchanged as hopeless; at first the "Shikaris" led easily, but gradually a few of the "1st Class Certificates" caught up, and in the final examination an old poacher driver, who could scarcely write his name, was a close second to a young Bombardier Woolger.

Some years later I met my old brigade again at Glen Imaal practice camp in 1914; it was a day of surprise targets jumping up in every direction, and I was looking on beside the C.R.A. Under a bush near the battery commander was the "look out" man rapping out description and position of each new target by clock code as quick as lightning. I could not see the man but was astonished at his efficiency, and after the shoot was over the C.R.A. called him up and told him he was the best "look out" man he had ever met. To my delight I recognised my old prize pupil, Bombr. Woolger, ex-sergeant, but alas still a bombardier! Last year I read his name on the Memorial at Le Cateau, where his battery and brigade wrote one of the finest pages in the history of the regiment. I can well believe he had the time of his life, and did his best day's work at his last "O.P."

The training I have referred to is capable of many adaptations. It has since been included in Artillery Training, Vol. I, § 252, and the first few books of Pelmanism are really based on the same ideas. Unfortunately, in peace time, power of observation, though a very unquestionable asset in every branch of life, is not a characteristic that is easily recognised in army life, and there are many I fear who in their heart of hearts consider observed shooting, to say the least, obsolescent. To these I can only state my conviction that a good observer will enable one battery in mobile operations to do the work of two or three. I have endeavoured to show that observation requires training, that blind men can be made to see, and fair observers improved out of recognition by developing the faculty of instinctively retaining a brain photograph of objects that have passed before the eyes. With this are closely associated other faculties such as the hunter's power of instantly detecting movement, even when not exactly in the direction in which he is looking;

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and the man who sees is also the man who can move without being seen. I wish to urge still more strongly that in the mobile warfare for which we are training the battery that takes the field with several really good observers among its officers and B.C's party will possess in them its greatest asset, the asset that differentiates between the offensive, destructive, battery, and the battery that fails to pull its weight. The spare trained men, as I personally experienced in 1914, will be invaluable in the battery patrol, for there has been no war in which a battery has not been scuppered by trusting to other eyes than their own.

With our diminutive army, and our comparatively small allotment of guns, we cannot afford to give away any single advantage that it is in our power to obtain. We possess the best field gun and the only shrapnel; we aim at maintaining the advantage we have proved in the ideal combination of accuracy with speed; we are more than maintaining our lead in predicted shooting. In "Observation" in its widest sense, from the natural characteristics of our race, we should be able to show a clear lead to all civilised powers; so let us make the most of it. It requires help, for at present there is little for it to live upon. The initiative must come from below, and the battery commander must demonstrate at practice camp and manœuvres the value of skilled and trained "look out" personnel, inspired by himself. The powers above, especially infantry commanders, must be led to appreciate the eyes of the artillery, and they will then insist on getting full value out of their gunner observation and information parties. Shooting with air observation, or by survey methods, is of course all important, and demands a big share of our time and the highest standard of training; but we must not forget that between periodical "hold-ups," when concentrations, bombardments, and barrages have to be called to our assistance, the battle is going on, and the eyes of the artillery can never rest. It is then that the skilled and determined observer can reduce our infantry casualties, win their hearts, help them forward and through tight corners, and take full advantage of every enemy that shows himself and every gun that skill alone can locate. With this sort of observation, and the guns of a brigade or more to support the eyes of each observer, many a "hold-up" will fail to develop. The accuracy of map-shooting is

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largely dependent on good registration and ground observation, and we shall certainly be making a serious mistake if we think that survey methods and air observation are going to affect the importance of the every day work of horse, field or pack artillery, or reduce by one round the number of shell fired in any battle on the initiative of the live battery commander at a good observation post; the battery that goes to war without a full appreciation of all that observation stands for may be a highly trained, finished, and scientific machine, but it will lack the human spark to make it live, and feel, and see.

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THE EVOLUTION OF ARTILLERY IN THE GREAT WAR.

VI.—EVOLUTION OF ARTILLERY TACTICS (2).

By Major (Bt. Lieut.-Colonel) A. F. Brooke, d.s.o., *p.s.c.*, R.A.

THE early months of 1916 were spent in reviewing the deductions drawn from the previous year's fighting, and in adjusting our organisation and tactics to meet the requirements of the decisions arrived at. New formations were now rapidly arriving in France, and the ammunition situation was improving, rendering possible offensive operations on a far larger scale than up to date. All efforts were being directed towards the preparation of a summer offensive which was to embody lessons learnt in previous fighting.

1. German Offensive at Verdun.

Determined to forestall the Allied spring offensive, the Germans launched their attack at Verdun before our preparations were completed. A study of this operation is of interest as it provides a concrete example of the deductions drawn by the Germans from their offensive operations on the Eastern front, and from the attacks to which they had been subjected on the Western front. The selection of the front of attack was influenced by artillery considerations. The front held by the French at Verdun formed a distinct salient, placing the German artillery in a favourable position to carry out concentrations of fire, and conferring on them the advantage of enfilade and reverse fire. Good railway communications existed allowing for the easy concentration of a large force of artillery, and its adequate supply of ammunition. The undulating nature of the country also favoured the employment of howitzers with which the Germans were well provided, whilst this topographical characteristic was ill-suited to the flat trajectory guns of the French artillery.

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Strategical surprise was not sacrificed and the ten hours' preliminary bombardment only admitted of local tactical dispositions to meet the attack. In order to allow of a short bombardment its intensity was proportionately increased by a large concentration of heavy artillery, numbering in all some 1500 howitzers and guns, and including a large proportion of the heaviest natures, two fifths of the howitzers being of 8″ calibre and over. The concentration of field artillery was comparatively small, only amounting to some 500 pieces in all.

We see the Germans in this attack endeavouring to retain the element of surprise by employing a short preliminary bombardment, yet anxious to obtain destructive results as exemplified by the large proportion of the heaviest types of howitzers. They had not yet fully appreciated the paralyzing effect of the intense bombardment of short duration which they adopted in 1918. The period of ten hours selected was too long to ensure effective neutralisation of the defence, and too short for any wholesale destruction. In subsequent attacks the Germans reduced this period considerably, and adopted the true hurricane bombardment, in the preparation of all their attacks on the Western front.

The assault was not supported by any form of barrage, the fire being directed on successive zones, its density varying according to their relative importance. First line defences, redoubts, observation posts, and command posts received special attention, whilst on the battery areas smaller concentrations of artillery were employed.

The results achieved were on the whole very similar to those of the allied offensives of 1915. In the first stage of the attack the French batteries of 75, sited in protected pits and only subjected to diluted concentrations of hostile fire, were able to render valuable services to the defence. As the attack progressed these batteries had to withdraw from their shelters whilst the reinforcing artillery was also devoid of protective pits. The heavy casualties inflicted by the French field artillery had also drawn the attention of the attackers to the necessity for a greater density of fire on battery areas. As a result, the French field batteries in the later stages of the attack, began to suffer serious casualties, and were no longer able to give the support they had provided at the outset. The

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incident is of interest since it provides a good example of the value of sound counter-battery tactics.

Throughout the attack restricted communications due to the salient they were operating in, seriously affected the French ammunition supply. The direct effect of communications on artillery power is thus exemplified. It was rare that batteries of 75 could be provided with more than a daily allowance of 250 rounds per gun. As this equipment was capable of firing two or three times this amount, the restricted system of supply had reduced the field artillery power by at least a half.

2. Battle of the Somme.

With five months of continuous operations, the Battle of the Somme provided suitable conditions for trying out some of the tactical ideas which had resulted from the last year's fighting. We have seen in a previous article that the organisation of the artillery had made distinct strides during the winter months preceding this offensive. We were now provided with an artillery capable of exercising a marked influence in the field of battle. Certain refinements in its organisation, and reinforcements to its strength were still required to bring it up to the standard which it reached during the latter part of the war, yet it had attained its early manhood, and its actions at this period are consequently of particular interest to us.

The policy of destruction received a free rein, both tactical and strategical surprise were entirely sacrificed, the four days' preliminary bombardment of Loos was replaced by one of seven days. We endeavoured to destroy all the wire covering the front system of defences, all fire trenches, strong points and main communication trenches, whilst the early stage of development of our counter-battery methods prevented us from also including the hostile batteries in our scheme of destruction. Trench mortars were now available in sufficient numbers to be entrusted with the destruction of the front line of wire entanglements. All other wire defences were engaged with 18 prs. firing shrapnel since no efficient wire cutting H.E. shell was available at that date. The trench destruction was entrusted to the Corps heavy artillery. The decision as to the degree of destruction required was transferred to the actual

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infantry units destined to carry out the attack. Such a procedure may at first strike one as logical. The individual destined to carry out an assault over a given trench system should be the best judge as to the degree of destruction required to ensure success to his undertaking. On closer examination the procedure presents certain aspects which alter the case. Destruction can only be obtained by protracted methods and by the creation of shell torn areas obstructing forward communication. Yet neither of these factors affected the enterprise of the unit to which a limited objective had been allotted, they only concerned the higher formations, but certainly exercised a vital influence on the operation as a whole. The result of such a decision could only lead to longer periods of preliminary destruction, and greater obstruction through shell torn areas.

Turning to the artillery support during the initial attack and the subsequent operations of the prolonged struggle, we observe distinct progress in the artillery tactics. We had failed to appreciate the paralyzing effects possible in preparatory bombardments but we were beginning to realise the neutralising possibilities in the support of the actual attack. The germ of the new "rolling" or "creeping" barrage had, as we have already seen, been evident at Loos. The battle opened with the attack of July 1st still supported by a system of "lifts" from trench to trench regulated by a pre-arranged time programme. The whole object of this method being to prevent the defenders manning their trenches until such time as the assaulting troops were sufficiently close to them to admit of the trench being rushed before its fire power could be re-established. The Germans were quick to realise that the only method of avoiding such neutralisation of the fire power of the defence lay in siting a proportion of automatic weapons in the space intervening between the trenches. It therefore became necessary to sweep the ground in advance of the attack, irrespective of all visible defences. We produced a curtain of fire moving in advance of the assaulting troops, regulated by a time table based on the predicted rate of advance of the infantry. By a process of trial and error we arrived at the required density of this fire, and the distance of each lift necessary to cover all the ground. With a maximum rate of fire of four rounds per gun per minute we found that one 18 pr. per 25 yds.

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of front would provide a sufficient maximum volume of fire, whilst variations in the density of this fire could be regulated by reductions in the rates of fire. To ensure that all ground should be covered by our curtain of fire in its forward movement, we decided that lifts of 100 yds. would meet requirements. During the course of the attack definite pauses were arranged conforming to the capture of the various objectives and providing the protection required by the infantry against hostile counter-attacks. As the battle progressed our curtain of fire was found to be lacking in sufficient depth. Casualties were suffered from hostile fire originating in advance of the zone covered by the barrage. This fault was remedied by additional curtains of fire from 18 prs., 4·5″ hows. and medium artillery in advance of the initial line.

The parent of the rolling barrage, namely the trench to trench lifts, had left an unfortunate legacy to its offspring in the shape of unnecessary complications. The attacking infantry, used to definite lifts from one trench to another, whilst approving of the intervening ground being covered, insisted on the curtain of fire being built up on each successive trench. Had all trenches been parallel to each other and to the front of attack complications would not have arisen. This was not the case, as a result barrages were attempted necessitating intricate evolutions of fire which were neither possible nor necessary, and calculated to introduce serious errors.

Our tactical conceptions of artillery support in the attack had by now altered materially from those held in 1914. The "accessory" rôle of the artillery was now left far behind, the days were gone of attacks planned by infantry with artillery requested to co-operate to the best of its ability. The infantry, deprived of its mobility through the hostile fire power, now required a combined plan of attack to regain its power of movement through the proper application of the available artillery power. This degree of mobility had, however, only been regained through the sacrifice of the power of manœuvre in the attack. Our plans of attack were assuming a rigidity which required considerable re-adjustment in our tactical ideas.

The long drawn out nature of the Somme battle provided suitable conditions for further developments in our systems of harass-

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ing fire, which had already been in evidence during the previous year's fighting. We realised that the efficiency of such fire was dependent on the accuracy of the available intelligence and the care with which programmes of harassing fire were produced.

Our lack of faith in the efficiency of our methods of counter-battery work is well exemplified by the massive gun emplacements constructed to support the initial attack. Gradually the lessons we had learnt in 1915, combined with our daily increasing experience, resulted in the adoption of improvised methods in an endeavour to co-ordinate the various existing counter-battery efforts. A Heavy Artillery Group H.Q. was selected in each Corps, and made responsible for counter-battery work, the commanding officer of the group becoming to all intents and purposes the counter-battery officer of the future. Although at that date still unofficially recognised, this new system at once produced marked improvements in our counter-battery methods. Hostile artillery intelligence now became systematically collected and collated, the work of survey sections was developed and turned to good use, methods of engaging hostile batteries became standardised, and last but not least, the co-operation of artillery and aircraft was directed into proper channels.

3. French Attack at Verdun.

We may now leave the battlefields of the Somme to examine, as the year closes, the two offensives carried out by the French to recapture lost ground and disengage their communications at Verdun.

It should first of all be noted that the tactical conceptions of these attacks were based on the capture of strictly limited objectives. The first entailed an attack on a 7 km. front preceded by a three days' preliminary bombardment, whilst the second embraced 10 kms. with four days' preparation. Both these attacks are examples of methodical preparation and execution, they achieved fully the limited object assigned to them. We had proved that with adequate material and time for preparation the success of an attack, strictly limited both as regards its object and its objective, could be ensured with reasonable certainty of success.

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4. Winter of 1916-1917.

The fighting of 1916 had left the situation in the Western front practically unaltered. Winter had now set in and with it came the period to review our recent fighting in order to re-adjust our tactical conceptions for the coming offensives of 1917.

We came to the conclusion that success in the initial stage of an attack could only be ensured through the selection of a strictly limited objective. It had, however, become evident that this objective should be sufficiently advanced to include the general area of the hostile battery positions. Even the most efficient system of counter-battery work could only be expected to neutralise the hostile artillery for a limited period, it was consequently necessary for the assaulting troops to complete the destruction of these batteries. Failure to do so left the bulk of the hostile artillery available to frustrate any further attempts to advance.

We therefore see the depth of penetration of the initial attacks extended in 1917. Such a procedure, however, entailed additional difficulties owing to the short ranging powers of our guns and necessitated the introduction of new tactical ideas in the deployment of the artillery destined to support attacks to such a depth. These can best be examined in connection with the offensives of 1917.

A further lesson of our recent protracted offensive lay in the necessity for regular reliefs of artillery. Divisional artilleries were found to outlive the infantry of their Divisions, and as a result grew to be looked upon as possessing immortal qualities. This evil was also greatly due to shortage of artillery and was partly unavoidable. Unfortunately the dangers of such a procedure were not sufficiently appreciated. The repetition of such errors in 1917, as we shall see, resulted in the fighting efficiency of the artillery being so seriously affected that it only just recovered from its exhaustion in time to meet the hostile offensive of 1918.

5. German Withdrawal to the Hindenburg Line.

Two important points were brought home to us by the German withdrawal to the Hindenburg line, namely :—

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(a) The loss of mobility engendered in the artillery as a whole by the prolonged period of static warfare.
(b) The mobility possessed by the medium artillery when properly handled.

The greater part of our artillery had been literally built into our trench system. On their arrival in France batteries moved into action where they remained for months on end. A large proportion of officers, N.C.O's and men were ignorant as to the capacity for manœuvre of their batteries. Battery commanders were tied to the apron strings of the artillery brigade headquarters, relying on the latter for all orders as to when to fire, what to fire, and which targets to engage. As a result of the spoon feeding of trench warfare a proportion of battery commanders had gradually lost the initiative required when confronted with more mobile situations. The lack of artillery reliefs which we have just referred to accentuated this evil as batteries in the line were deprived of all facilities for any mobile training.

The various Artillery Schools existing in France at the time were called to the assistance to remedy these defects which, however, had not been fully overcome by 1918. Although the medium artillery was similarly affected as a whole, yet the method by which individual batteries were handled proved conclusively that the mobility possessed by this nature of artillery, when properly handled, was in excess of our previous expectations and compared very favourably with that of the field artillery.

Before leaving this phase of the operations attention must be drawn to the selection and preparation of the Hindenburg line by the Germans. It would be hard to find an example of a defensive position exemplifying better the tactical doctrine that the artillery and machine gun form the backbone of the defence. Throughout its whole length the natural features had been utilised to favour the fire power of the defence at the expense of the attacker.

6. British Offensive at Arras.

By the beginning of 1917 we had reached a stage in the evolution of artillery equipment and organisation which admitted of our latest tactical ideas being fully tested. Our spring offensive on the Arras front is consequently of interest since it afforded the first real

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opportunity of employing the new artillery power which we had created and free from the many difficulties which had been evident during its development.

When studying the period of Artillery Growth we examined in some detail the battle of Neuve Chapelle as an example of our first serious offensive operation. It will therefore be advisable to carry out a similar study of the Arras offensive as a typical example of the period we have at present under consideration. It is sufficient for our purpose if we select the attack of the Canadian Corps with the Vimy Ridge as its objective. This attack formed part of the main III Army Arras offensive, and provides a good example of artillery tactics employed for the attack as a whole.

Preparations were commenced at an early date when the front of attack was still held on a defensive basis, namely two Divisions on a front of some 6700 yds. from which four Divisions were to deliver the attack. All artillery preparations had consequently to be centralised at Corps R.A. H.Q. Estimates of artillery reserves available for the attack were drawn up by G.H.Q. together with their distribution to the Armies concerned. These in turn drew up allotments of guns to Corps and notified them as to probable number to be expected. The Corps R.A. H.Q. finally drew up a distribution of guns to Divisional fronts based on their respective front of attack and depth of penetration. A plan for the deployment of the whole artillery of the Corps was then drawn up, and positions for all batteries selected by Corps R.A. H.Q's. The two divisional artilleries in the line were subsequently instructed as to the necessary preparations to be carried out for the incoming artillery.

On the two southern divisional fronts the depth of penetration was such that the attack could not be supported throughout its advance by batteries sited at a normal distance from the front line. This difficulty was overcome by siting a proportion of the batteries in "forward silent positions." Five field artillery brigades (ninety 18 prs.) were sited in such positions within 1000 yds. of the front line. These guns were not intended to take any part in the preliminary bombardment, or early stages of the attack, and only opened fire when the main battery positions were outranged by the advance.

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In order to ensure the necessary co-ordination the G.O.C. R.A. of the Corps was placed in direct command of all artillery on the Corps front, including of course all divisional artilleries. Details as to density, distribution and command of the artillery supporting the attack are shown in Appendices "J" and "K."

The attack was preceded by a seven days' preliminary bombardment, but in addition a gradual increase of activity from artillery positions already occupied, commenced twenty days before the attack.

The preparation for the attack consisted of a most comprehensive destructive programme. Trench mortars and 18 prs. were to destroy all wire in the front system of defence. Medium and heavy artillery were responsible for cutting lanes in the wire of rear lines of defence, the limited number of 106 Fuze available being allotted for this task. Trench destruction included all forward systems and portions of the rear lines. This destructive programme in the case of the medium and heavy artillery amounted to 42,000 yds. of trench and 8000 yds. of wire. In carrying out these tasks 91,000 rounds were expended on the trenches and 8000 rds. on the wire, namely two rounds per yard of trench and one round per yard of wire !

In addition to the above the village of Thelus was subjected to a systematic bombardment by super and heavy howitzers entailing an expenditure of 24,000 rounds. Other villages such as Tilleuls, Farbus, Givenchy, Vimy, La Chaudiere and Willerval were also subjected to lesser concentrations of fire.

Concurrently with the above tasks a programme of systematic destruction of all known hostile batteries was undertaken, together with that of observation stations and telephone exchanges.

The preliminary bombardment included a series of feint barrages with the double object of checking the efficiency of the barrage, and to mislead the enemy as to the actual hour of the attack. In order to induce the defenders of the front trenches to reluctantly reman their parapets after the barrage had passed over, the fire was brought back suddenly on to the front system after a few lifts had been carried out.

The supply of ammunition for an attack of this nature presented serious difficulties. Dumps of ammunition (up to 600 rounds per

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18 pr.) were required for the day of the attack, and had to be established in addition to meeting the heavy expenditure for the preliminary bombardment. A column of ammunition wagons, ten miles in length, was necessary every night during the period of the preliminary bombardment, and presented a serious problem of traffic control owing to restricted roads available and limited hours of darkness.

The artillery support of the attack consisted of a true rolling barrage of considerable depth. Two-thirds of the available 18 prs. were distributed on the line of the barrage immediately in front of the attacking troops, the remaining one-third was on a line 100 yds. in advance, 4·5″ hows. engaged important points not less than 200 yds. in advance of the front line, whilst medium and heavy hows. were similarly distributed not less than 300 and 400 yds. respectively in front of the same line. The preparation of the barrage map was undertaken by Corps R.A. H.Qrs. and necessitated the co-ordination of the artillery of the four attacking divisions, together with that of the neighbouring Corps. This matter was further complicated by the fact that the southern corps boundary also represented the inter-army boundary. A difference of one minute existed in the time for the lift from the first line of the barrage between the two divisions flanking on the boundary. As no settlement could be arrived at between divisions, the matter was referred to the respective corps with similar results, necessitating reference to the armies concerned. The matter was still under discussion when the barrage map had to be printed, necessitating a compromise between the two divisions. The incident is mentioned as a good example of the difficulties that are likely to arise in co-ordinating an attack where boundaries between large formations are concerned.

The average rate of fire throughout the attack was settled at three rounds per gun per minute for 18 prs. with reductions during the various protective barrages. Owing to the depth of the southern portion of the attack, the final objective was not reached till $7\frac{3}{4}$ hours after zero hour, this of course entailed very heavy ammunition expenditure as exemplified by the following figures showing maximum number of rounds fired by individual batteries on the day of attack:—

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One 6-gun 18 pr. battery	...	...	6021	rounds
,, 6 ,, 4·5″ how. ,,	...	...	3500	,,
,, 4 ,, 6″ ,, ,,	...	...	1017	,,
,, 4 ,, 9·2″ ,, ,,	...	...	905	,,
,, 6 ,, 60 pr. ,,	...	...	1178	,,

The destructive counter-battery programme which had taken place during the preliminary bombardment was followed by one of intense neutralisation during the actual attack. All hostile batteries which had survived the destructive shoots were subjected to neutralisation varying in its intensity according to the degree of exposure of the attacking infantry to hostile artillery fire.

It is unnecessary for our purpose to go into any further details as to the artillery plan for the attack, and sufficient to register the fact that the attack was entirely successful. With a few minor exceptions all objectives were gained according to programme, whilst 4000 prisoners, 63 guns, 124 machine guns and 104 trench mortars were captured. The destructive bombardment had achieved all that was asked of it, unfortunately it had done even more and had entirely obliterated all forward roads and communications leading through the captured position. In breaking down the tactical barriers which had opposed our advance, we had created new administrative ones preventing any further progress. The delays entailed in mending roads to admit of the forward move of the artillery and its adequate supply of ammunition enabled the enemy to complete fresh defences requiring further deliberate operations.

Before leaving the battle of Arras the important fact must be noticed that even before this operation distinct doubts were arising as to the soundness of tactical doctrines favouring protracted preliminary bombardments. Plans were submitted to reduce the period of the bombardment preceding this attack to 48 hours on the III Army front. Unparalleled violence and alternative periods of bombardment and counter-battery work by all the available artillery were the main characteristics of this plan. With the available resources of artillery the new method would have entailed daily expenditures of approximately 720 rounds per 18 pr., and 480 rounds 60 pr. and 6″ how. per gun. It is doubtful whether equipments and detachments would have stood such a strain. The conception,

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however, shows a distinct tendency to return to the type of "hurricane bombardment," the neutralising effects might have compensated for any loss of destruction, but the reduction in the period was not sufficient to regain the true elements of surprise.

Subsequent attempts were also made in later attacks, but always met with considerable opposition, we had grown to believe that destruction was essential, and would not risk sacrificing the certain capture of a limited objective through destruction for the possible real penetration through neutralisation.

7. French Offensive on the Aisne.

The result of these operations was so seriously influenced by conditions prevailing in the French Army at this period that it is unsafe to draw any deductions from the tactical methods employed. As a strong supporter of the distant objective, General Nivelle naturally influenced the artillery plans with this object in view. The preliminary bombardment, of five days' duration, was intended to engage all successive lines of hostile defence within range of the guns. On a front of attack of some 40 km. in length 2000 75 guns, 1930 heavy pieces, 17 super guns and 1656 trench mortars were assembled. The weather was bad, seriously affecting aerial observation, necessitating a prolongation of the bombardment to nine days. Even with these extra four days the results sought for were not attained. In an attempt to destroy rear lines of defence, front ones received insufficient attention. Lack of destruction may have contributed to the failure of an operation which had already been seriously imperilled in its initial conception.

8. Messines.

The artillery tactics employed at the battle of Messines were to all intents and purposes similar to those at Arras, and consequently need not be examined in detail. The objective of the attack was a strictly limited one, but entailed sufficient penetration to include the hostile artillery area. The main feature of tactical interest lies in the artillery duel which developed during the period of the preliminary bombardment. The enemy had by now realised that the success of the methods we had adopted depended on the efficient employment of our artillery. Consequently the system of defence

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intended to meet such attacks must necessarily endeavour to reduce the artillery power supporting the attack. The German counter-battery methods had by this time made considerable progress, and set out to defeat the British artillery prior to the attack. Although this attempt failed, results were sufficiently serious to give rise to serious anxiety up to within two to three days of the attack, when we finally obtained a definite superiority of artillery fire.

The hostile artillery tactics of the defence had gone one step further. The projected front of attack could be estimated by the area engaged during the preliminary bombardment, thus indicating the battery areas likely to be immediately affected by the penetration. These areas were thinned out, whilst artillery was concentrated on the two flanks of the suspected attack. Such a procedure necessitated special reinforcements to the counter-battery organisations of Corps on the flank of the attack calling for close co-ordination on the part of Army H.Qrs.

9. Ypres.

We have now arrived at the climax of the destructive period as exemplified by the artillery tactics employed in the Third Battle of Ypres, whilst the nature of the soil on this portion of the front could not have been better chosen to bring out the full disadvantage of over-bombardment. Political and strategical considerations do not enter into the scope of our present study, our outlook must be purely through artillery spectacles. Experience has taught us that the artillery power developed by a given number of guns was influenced by the shape of the front to be attacked. When operating against a salient such as Neuve Chapelle 1915, Fricourt 1916, Messines 1917, greater facilities for developing artillery power existed than against a straight front. On the other hand certain definite causes restricted the output of power from artillery operating within a salient. Restricted areas for siting batteries rendered them more liable to neutralisation. Limited communications resulted in congestion, increased casualties and difficulties in ammunition supply. Whilst the impossibility to use both enfilade and reverse fire, combined with increased exposure to such fire, was a disadvantage inseparable from artillery operating within a salient. From previous attacks we had also learnt that protracted

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bombardments destroyed all artificial features. The selection of a district depending on an intricate drainage system for the disposal of surface water, was certain to add to the obstacles created by such bombardments.

Regarded from an artillery point of view the selection of the front of attack was, to say the least of it, an unfortunate one, and calculated to seriously restrict the output of the available artillery power.

The protracted nature of the operation was equally unfortunate. From our experience gained during the previous offensives of that year, we had learnt the advantage of rapidly transferring our strategical reserves of artillery from one portion of the front to another. The mobility of our medium and heavy artillery presented a strategical asset which was sacrificed by continuing the offensive once conditions had become unfavourable for further efforts.

A detailed study of the operations is of little value as the artillery tactics employed were on the whole similar to those used during the previous attacks of that year. Any change or additions were only due to the exceptional conditions prevailing during the attack, and have little bearing on the evolution of artillery tactics as a whole.

We cannot, however, leave this operation without examining one further evil which resulted from a neglect of previous lessons. We have seen that in the latter stage of the battle of the Somme the danger of insufficient artillery reliefs had become apparent. During the battle of Ypres we wasted a proportion of artillery power by operating within a salient and under unfavourable conditions, and endeavoured to make good the shortage which resulted by maintaining artillery indefinitely in action. Some batteries remained in the line for three months without a relief, under the most trying conditions, living in a sea of mud, subjected to continual concentrations of fire, and only withdrawn after suffering over 100% of casualties to personnel and equipment. Under such conditions a large proportion of batteries could only be expected to develop a very small percentage of their normal power. A consideration of equal importance lay in the fact that they had reached a stage of exhaustion such as would take months to recuperate from.

History repeats itself, similar conditions are certain to recur

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in the future. Artillery is an expensive arm and will consequently always fall short of requirements. The temptation will therefore always exist to tax it to the utmost. It is to be hoped that we may remember the lesson of the third battle of Ypres and realise that although the process of exhaustion may be slow when compared with other arms, it is just as certain in its action whilst the period of recuperation is proportionately longer.

10. French Offensive at Verdun and Malmaison.

The two French offensives at Verdun and Malmaison bring the period of destruction to a close. Neither of these attacks brought any new artillery methods to the light, and are mainly characterised by the mass of material employed. Preceded by preliminary bombardments of seven and six days respectively they entailed only the capture of strictly limited objectives.

A general idea of the dimensions which the bombardments had assumed may be gathered from the fact that at Verdun between the 13th and 27th August the French expended a total of 120,000 tons of ammunition, the equivalent of 360 train loads! Whilst at Malmaison the density of artillery was such that if all guns and limbers had been formed up in one straight line, its total length would have been equal to the front of attack of 10 km!

11. Deductions.

From the battles which we have just considered it will be seen that we had gradually arrived at certain tactical methods by which we could, almost with mathematical exactitude, rely on limited success. We had proved that with sufficient artillery, supplied with unlimited ammunition and facilities for covering a required area with the necessary density of shell, we could almost guarantee a penetration of two to three thousand yards, namely up to the extreme range of the supporting artillery. Consequently by a series of successive efforts, it may be argued that a method existed through which we could slowly push the enemy back at a distinct price in men, money and effort. Closer examination of this method shows clearly that decisive results could only be obtained by radical changes in our tactical conceptions. We had sacrificed surprise, the enemy was at liberty to employ methods calculated to ensure

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a lower rate of casualties, whilst the possibility of realising any strategical stroke was denied to us. The ammunition expenditure entailed by our bombardments must eventually exercise a strain which no nation could stand, whilst the destruction caused turned the country into a desert. Evidently new methods must be sought.

We had, however, during the period under review, made certain distinct strides which may briefly be classified as under :—

(a) We were now possessed of an artillery which both as regards equipment and organisation was such as to fit it for other tactical methods than those we had employed up to date.

(b) We had made definite strides as regards methods of engaging hostile artillery. We had begun to realise that an intense destructive counter-battery policy prior to an attack, lessened our ability to neutralise the hostile artillery on the day of the attack. Such a procedure was liable to "flush the coveys" prior to the day of attack, thus rendering them hard to find at the critical moment.

(c) Methods of locating batteries had made rapid strides. Concealment no longer provided security. Silence was the only safe protection for guns of the defence.

(d) Our methods of fire had made great progress and were rapidly becoming less dependent on observation.

(e) Finally, the introduction of gas and smoke shell in sufficient quantities greatly increased the neutralising power of of artillery.

Although we had been floundering in the mud of our bombardments in vain efforts to destroy the obstacles protecting the hostile fire power, we had nevertheless gradually reached a state of greater efficiency and were in a better position to employ our artillery power in the future for its legitimate task of neutralisation as opposed to destruction.

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Appendix J.

DENSITY OF ARTILLERY FOR VIMY RIDGE ATTACK.

	Total Number of Guns.		After deductions for C.B's and Forward Brigades.				Remarks.
	Guns.	Yds. per Gun.	Empld. as C.B's.	Fwd. Silent Btys.	Balance for Barrage.	Yds. per Gun.	
18 pr.	480	14	—	90	390	17	
4·5″ how.	138	50	36*	18	84	80	* Including 3 4·5″ how. btys. from zero onwards.
6″ how.	104	64	8	—	96	70	
8″ & 9·2″ how.	72	93	28*	—	44	150	* Including 3 9·2″ how. btys. from zero onwards.
60 pr.	54	124	54	—	—	—	
6″ gun.	8	837	8	—	—	—	
2″ T.M.	96	70	—	—	—	70	
9·45″ T.M.	24	280	—	—	—	280	

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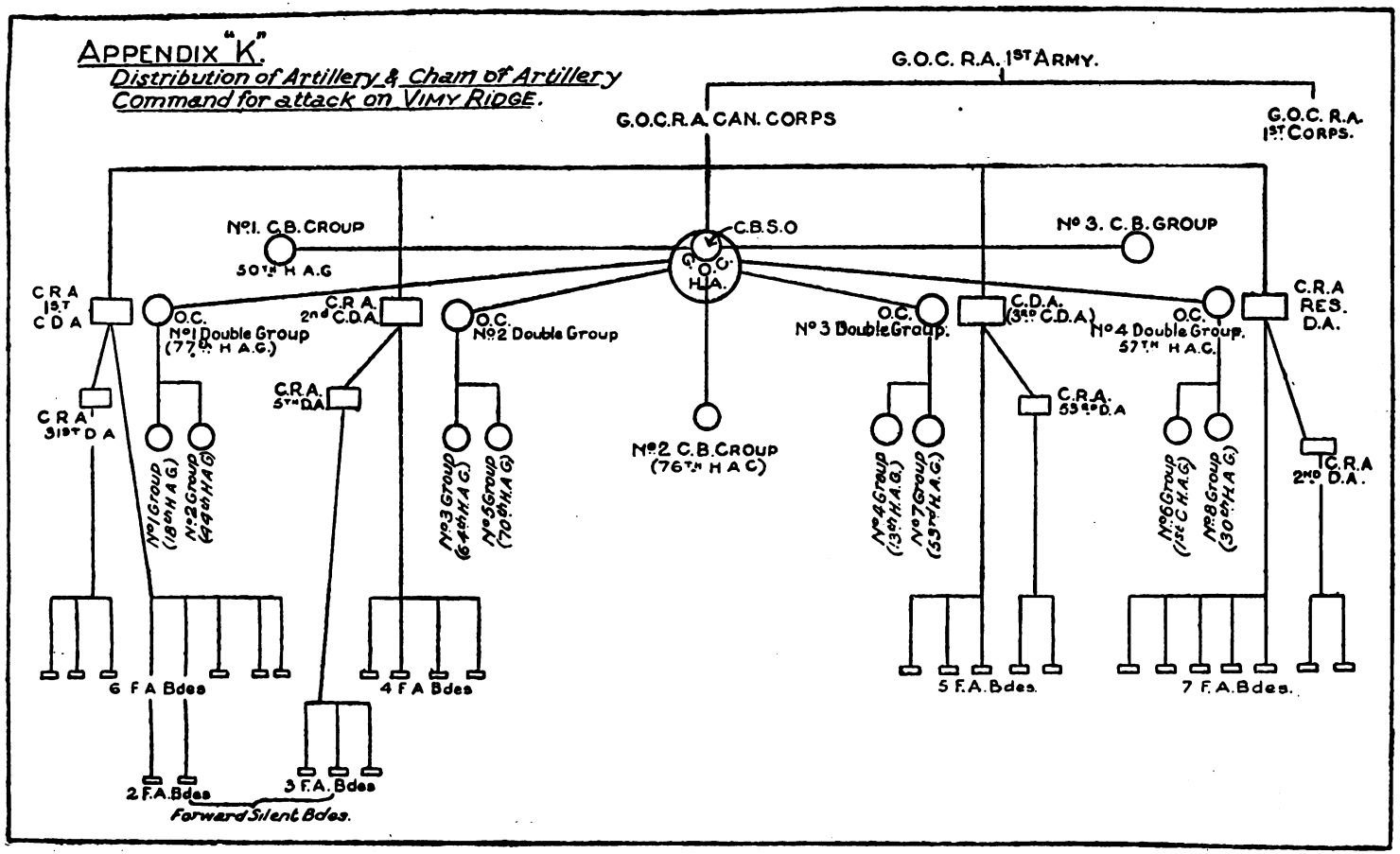
APPENDIX "K".

Distribution of Artillery & Chain of Artillery Command for attack on VIMY RIDGE.



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THE RE-ORGANISATION OF ROAD TRANSPORT.

By Major (Temp. Lt.-Col.) W. G. Lindsell, D.S.O., O.B.E., M.C., *p.s.c.*, R.A.,

ARMY Orders have been published recently containing amendments to F.S.R., Vol II, which considerably affect the system of ammunition supply in the field. In consequence of these changes it is thought that some further explanation of the new system of transport organisation in front of railheads will be of interest to artillery officers. The changes now contemplated arise primarily from the increased use of mechanical transport for army purposes generally and from improvements in, and the capabilities of, the light 30-cwt. lorry on pneumatic tyres.

Principles involved in transport organisation.

In planning any road transportation organisation there are three main principles which need to be kept in mind, they are :—

(a) The organisation must aim at keeping transport as fluid as possible.

(b) The organisation must be elastic.

(c) The organisation must be adaptable to meet any needs of the moment.

To consider these principles in greater detail :—

Keeping transport fluid means pooling resources to the greatest extent possible. Every unit must of course be provided with sufficient transport for its own immediate needs, but this allotment must be kept to the absolute minimum. All other road transport vehicles should be on the establishment of organised transport units which can be used for general purposes. The nearer the front line, the less fluid transport becomes, but further back towards railhead the possibilities of pooling increase and should be adopted to the fullest extent possible in the interests of the force as a whole.

Elasticity of our transport organisation means capability of expansion or contraction in accordance with fluctuating strengths

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and varying demands on its carrying capacity and of covering varying distances. It may at times be necessary to introduce an extra echelon to avoid cramping the mobility of a particular force, conversely one or more of the normal echelons may sometimes be dispensed with and the transport thus released be made available temporarily for other services. Too rigid a transport organisation tends to reduce the freedom of action of a force. The new transport organisation now admits of 2nd and 3rd line echelons being readily detached in conformity with any detachment of the fighting units which they are normally designed to serve.

Adaptability of our organisation is necessary to meet changing circumstances and the necessity for improvisation. Although a force may begin a campaign with what is considered to be the best form of transport for the particular theatre of operations, it is difficult to foresee all and every circumstance which may arise necessitating the alteration of vehicles, loads and methods. Such difficulties may come from soil, climate, or many other causes, of which the necessity of using pack transport in France and Flanders, and the changes from river to sleigh transport in North Russia are instances.

Types of road transport

Putting aside for the moment pack and carrier transport, we now have three main types of road transport in common use in the army :—

(i) *Horse transport*—the L.G.S. wagon normally used for first line unit transport and as a reserve second line transport agency in certain circumstances.

(ii) *Light M.T.*—consisting of 15-cwt. pneumatic tyred vans and 30-cwt. light lorries also on pneumatic tyres, used normally for second line transport.

(iii) *Heavy M.T.*—the 3-ton lorry on solid tyres used normally as third line transport.

The use of heavy M.T. presupposes good roads but light M.T. is capable of good performance on indifferent roads and can operate to quite a surprising extent even across country. When the limit of the capabilities of light M.T. is reached we must fall back on horse transport, and we should aim at training our

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transport animals for pack work, to deal with country where wheels cannot be used as in the devastated areas of the Ypres salient and the Somme battlefields.

It is unnecessary to enlarge on the organisation and functions of unit first line transport with which all officers are familiar, the changes in its composition since the war are only in matters of detail affecting individual units.

Second line transport has, however, been considerably re-organised. In the case of divisions and cavalry divisions the organisation is now identical and consists of a headquarters divisional R.A.S.C. and four units, namely :—

(a) A divisional train.

(b) An ammunition company R.A.S.C.

(c) A divisional M.T. repair company.

(d) A horse transport company.

The Divisional Train is equipped with light pneumatic tyred vans (15-cwt.) and lorries (30-cwt.), it is intended to carry the authorized scale of baggage and greatcoats for the division, 130 tons of supplies and forage, 12 tons of ordnance stores, 6 tons of R.E. stores, and mails, constituting the normal daily supplies for a division in the field. The train is divided into four companies, one for each infantry brigade and one for divisional troops, other companies can be added as necessary for the supply of additional attached units. Each train company has a supply section and a baggage section.

The Ammunition Company R.A.S.C. is a new unit also equipped with light (30-cwt.) pneumatic tyred lorries, it now takes the place of the former S.A.A. sections of the old divisional train and also of the former "B" echelon of the D.A.C. which has now been abolished. This new ammunition company R.A.S.C. carries approximately 147 tons of ammunition. It is divided into two sections, one for S.A.A. and grenades and one for artillery ammunition, the latter has sub-sections for 18 pr., 4·5 inch how. and 3·7 inch how. ammunition.

The normal function of the ammunition company is to carry ammunition between the A.R.P. and Infantry Brigade S.A.A. reserves and the D.A.C. in the case of artillery ammunition.

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The D.A.C. remains an artillery unit but consists wholly of what was formerly the "A" echelon or horse-drawn portion. It should however be noted in this connection that 3·7 inch how. ammunition is now carried in the Ammunition Company R.A.S.C., whereas none was carried formerly in "B" echelon of the D.A.C.

The Divisional M.T. Repair Company is organised and equipped for carrying out all second line repairs for the general transport vehicles in the division. It can be split into four separate sections when necessary, though normally the best results will be obtained when working as a complete unit. Second line repairs are those that can be carried out within four days with the plant provided in the repair company.

The Horse Transport Company is equipped with L.G.S. wagons, it can carry approximately 40 tons weight of stores and is intended as a reserve transport agency for baggage, supplies, ammunition or stores in circumstances when units cannot be reached by light M.T. vehicles.

Non-divisional units. For the maintenance of non-divisional units such as tanks, medium artillery, corps cavalry regiments, etc., there is no unit called a Corps Troops or Army Troops Train, but all these units are now provided in their war establishments with second line transport (R.A.S.C.) for baggage and supplies. This second line transport will be included in the corps transport column of the corps with which the units are serving, or, when such units are temporarily attached to divisions, their second line transport will similarly be attached to the divisional trains of the divisions concerned.

For ammunition supply purposes of non-divisional units there is to be a Corps Troops Ammunition Company R.A.S.C. This company will have 30-cwt lorries and will consist of sections for each army field artillery brigades, medium brigade, or tank battalion for the time being allotted to the corps. This ammunition company will perform identical services for the non-divisional units to those performed by the Divisional Ammunition Company R.A.S.C. for divisional units.

The only exception to this system of ammunition supply is that of the A.A. batteries. In their case, owing to the probably

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large areas over which they may be distributed tactically, no ammunition lorries are included in the corps troops Ammunition Company R.A.S.C. but two light lorries per gun will be allowed on battery establishments for the maintenance of ammunition supply forward from A.R.P.

Third line transport, heavy M.T.

The third line transport provided for the maintenance of formations as regards supplies, ammunition and repairs is grouped together to form the Corps Transport Column, under the A.D. of S. & T. of the corps.

A corps transport column will consist of :—

(a) *A maintenance company* for each division in the corps for the carriage of supplies, mails, ordnance stores and ammunition.

(b) *A corps troops maintenance company* to perform the same functions for all non-divisional units in the corps.

(c) *A reserve M.T. company* for emergency and general transport purposes, with a carrying capacity of approximately 250 tons.

(d) *A corps troops M.T. repair company* for second line R.A.S.C. repairs for non-divisional units.

(e) *A vehicle reception park* to facilitate the rapid replacement of breakdowns.

Each maintenance company consists of a supply section and an ammunition section, their normal functions being to work from the respective railheads forward to the supply or ammunition refilling points.

The diagram with this article shews the normal system of working of the various echelons in mobile operations. This normal system is, however, an elastic one and does not preclude the possibility of any echelon working further forward when circumstances render it possible and advisable.

Sometimes, when distances to be covered admit, one or more echelons may be dispensed with, and the transport thus saved can then be utilised for other purposes. Though this may frequently be possible in the case of supplies it will generally be inadvisable in the case of ammunition, as the available reserve on wheels in front of railhead would be dangerously curtailed, and the propor-

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tion of the different natures (smoke, H.E., shrapnel) at call would be upset thereby.

Radius of action and speed.

On good roads and during daylight the solid tyred 3-ton lorries can maintain an average running speed of 10 m.p.h. when working in convoys, while the 30-cwt. lorries on pneumatic tyres can average 15 to 18 m.p.h. When working at night, in bad weather, or on indifferent roads these figures must be considerably reduced, with large convoys under service conditions not more than half the above speeds should be counted on at night.

Under war conditions and allowing time for loading and unloading, cleaning, fueling and oiling vehicles, and for reasonable rest for the drivers, it has been found uneconomical to run lorries much more than an average of 50 miles a day. This figure can of course be exceeded when necessary and the practical working limit is in or about 90 miles a day for heavy lorries and 130 miles for light lorries on good roads. It must, however, be realised that long journeys cannot be combined with effective concealment from air observation. The military situation will in consequence usually be the determining factor in deciding on the maximum distance which can be covered.

The use of two M.T. echelons admits of deliveries of goods being maintained up to 50 miles from railheads without undue strain. This should not, however, be taken as normal, and generally speaking delivery points should be considerably less than 50 miles from railhead if reasonable concealment from air observation is to be obtained. From a consideration of the above points a figure can be arrived at for the distance between railheads and the gun line, or the infantry unit, both for economical working and as a practical maximum as follows:—

	Economic radius.	*Maximum radius.*
3rd line M.T. Coys. ...	25 miles	45 miles
2nd line M.T. Coys. ...	25 miles	65 miles
1st line H.T.	6 miles	10 miles
Totals ...	56 miles	120 miles

It may be argued that in the above figures no allowance has been included for the distance to be covered by the battery ammunition wagons in the case of ammunition supply. In mobile

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operations it is unwise to count on this echelon being used other than for lateral distribution purposes, and these battery wagons in continually attending on the guns will soon cover their own maximum mileage without being considered as available to bridge a gap in the chain of supply from railhead to gun, or they may, and often will, be used in common with the D.A.C. horse drawn vehicles for carrying ammunition from the lorry head (delivery point) to the gun line.

Maintenance of M.T. vehicles.

The increased use of M.T. in the army has brought the question of the necessary repair organisation into considerable prominence, and it will be seen that this aspect of the question has been provided for in the new road transport organisation.

Every unit is now provided with artificers, equipped with hand-tools, to enable them to carry out first line repairs. While every formation, division, cavalry division, corps, army or G.H.Q. is provided with a repair unit (M.T.) equipped with a mobile workshop capable of carrying out second line repairs, that is repairs that will not take longer than four days to complete. When more extensive repairs are necessary the vehicle is replaced from the vehicle reception park and the damaged one is evacuated to the base heavy M.T. repair shop where all L. of C. repairs are carried out.

An important aspect of the maintenance of M.T. vehicles is the supply of spare parts. For the very large number of mechanical vehicles now included in the expeditionary force this problem has assumed very considerable proportions, entailing the provision of well laid out and well organised base store depots.

To facilitate the problems of maintenance there are two important points which are now receiving considerable attention. The first is standardisation, the second is training. As regards standardisation every effort is being made to reduce the number of types, and to equip each unit with one type only in so far as this is possible. As regards training it is obvious that the better trained the drivers and artificers the less replacements will have to be provided. This is an aspect of the question which is already affecting a large number of artillery officers, and is likely to interest many more in the not too distant future.

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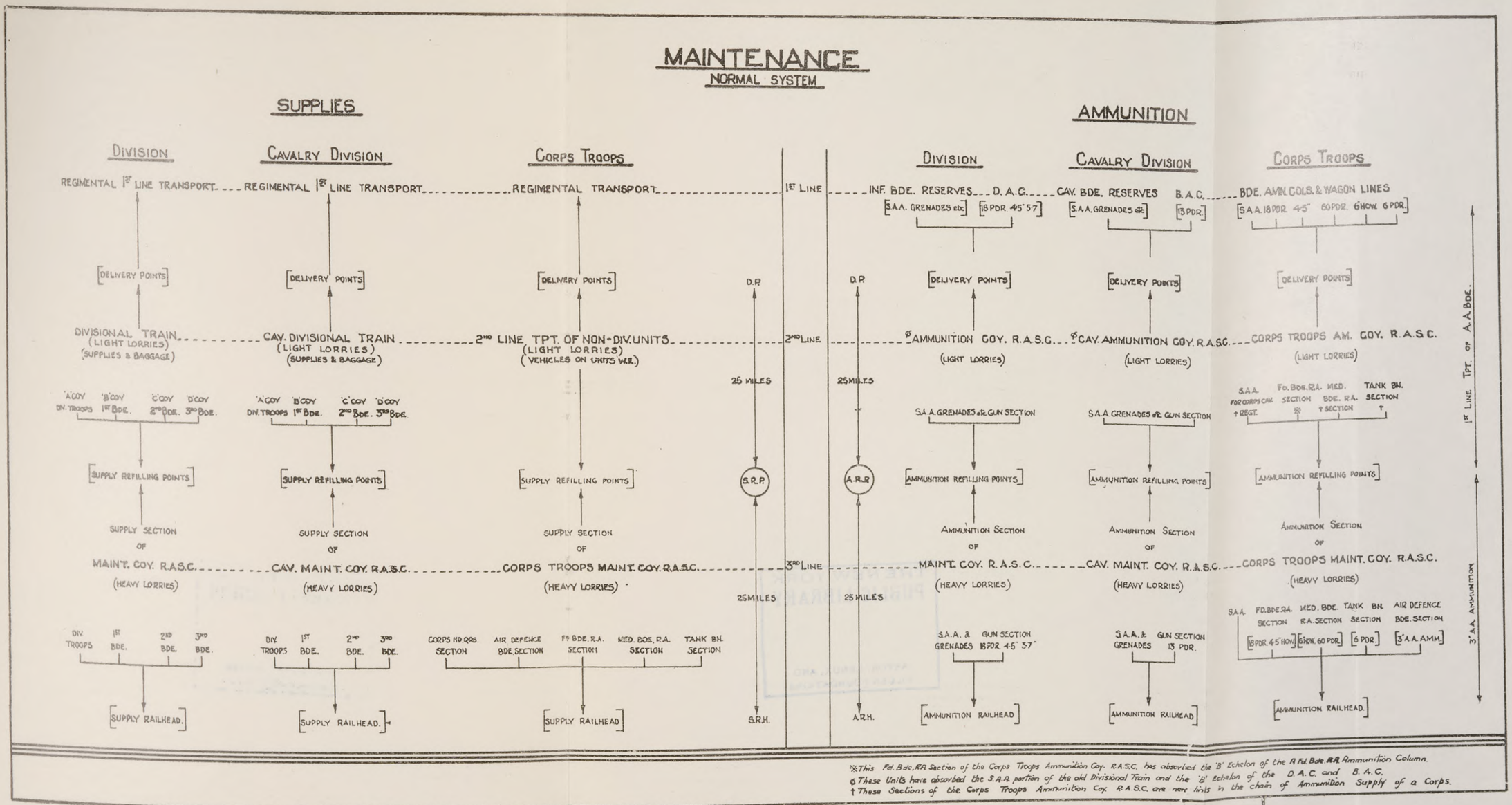
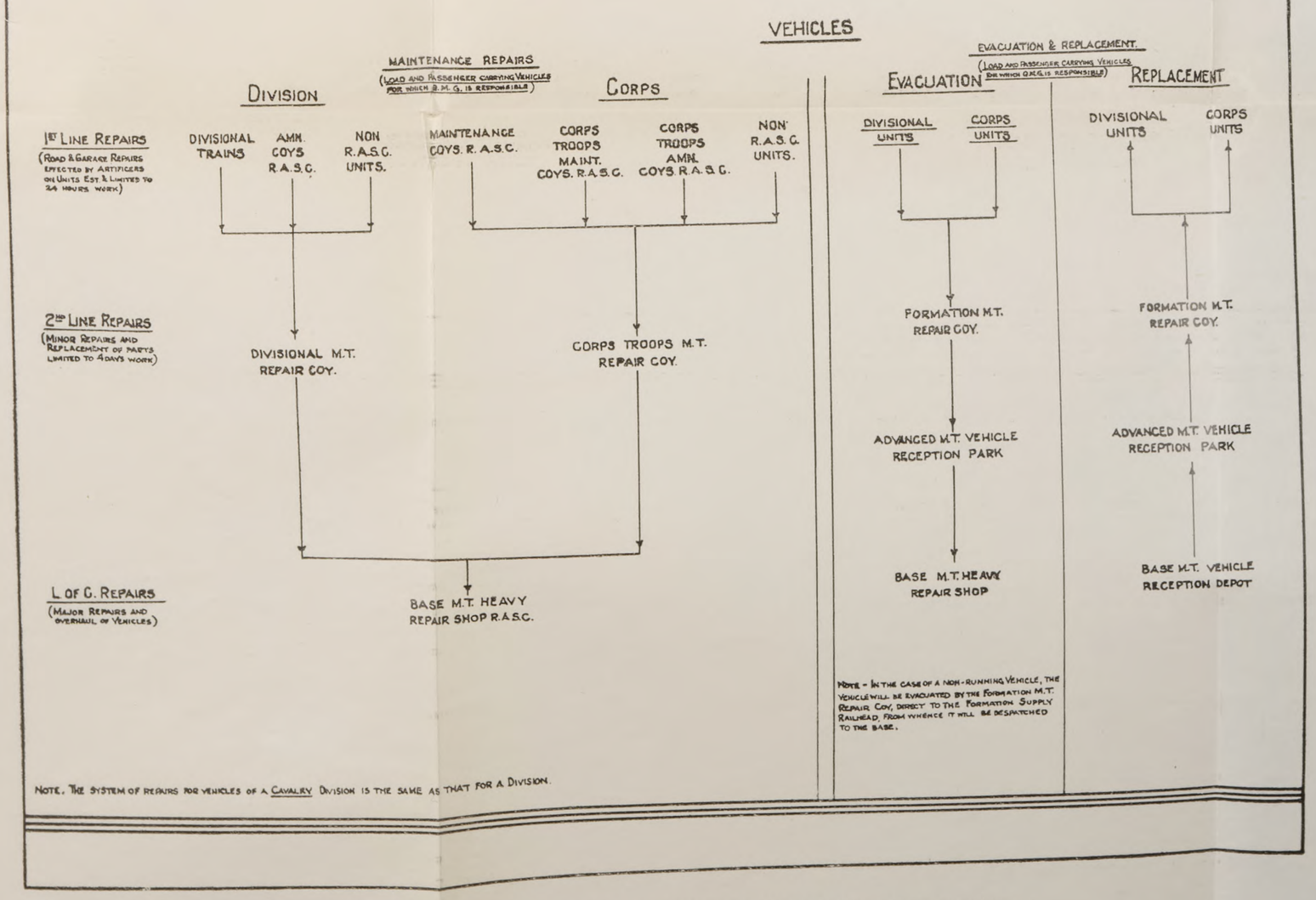

MAINTENANCE
NORMAL SYSTEM
SUPPLIES
AMMUNITION
DIVISION
CAVALRY DIVISION
CORPS TROOPS
REGIMENTAL 1ST LINE TRANSPORT
REGIMENTAL 1ST LINE TRANSPORT
REGIMENTAL TRANSPORT
1ST LINE
INF. BDE. RESERVES
D. A. C.
CAV. BDE. RESERVES
B. A. C.
BDE. AMN. COLS. & WAGON LINES
S.A.A. GRENADES etc
18 PDR. 4·5" 5·7
S.A.A. GRENADES etc
13 PDR.
S.A.A. 18 PDR. 4·5" 60 PDR. 6 HOW. 6 PDR.
DELIVERY POINTS
DELIVERY POINTS
DELIVERY POINTS
D.P.
DELIVERY POINTS
DELIVERY POINTS
DELIVERY POINTS
DIVISIONAL TRAIN (LIGHT LORRIES) (SUPPLIES & BAGGAGE)
CAV. DIVISIONAL TRAIN (LIGHT LORRIES) (SUPPLIES & BAGGAGE)
2ND LINE TPT. OF NON-DIV. UNITS (LIGHT LORRIES) (VEHICLES ON UNITS W.E.)
2ND LINE
9 AMMUNITION COY. R.A.S.C. (LIGHT LORRIES)
9 CAV. AMMUNITION COY. R.A.S.C. (LIGHT LORRIES)
CORPS TROOPS AM. COY. R.A.S.C. (LIGHT LORRIES)
'A' COY DIV. TROOPS
'B' COY 1ST BDE.
'C' COY 2ND BDE.
'D' COY 3RD BDE.
'A' COY DIV. TROOPS
'B' COY 1ST BDE.
'C' COY 2ND BDE.
'D' COY 3RD BDE.
25 MILES
25 MILES
S.A.A. GRENADES & E. GUN SECTION
S.A.A. GRENADES & E. GUN SECTION
S.A.A. FOR CORPS CAV. † REGT.
FD. BDE. R.A. SECTION ※
MED. BDE. R.A. SECTION †
TANK BN. SECTION †
SUPPLY REFILLING POINTS
SUPPLY REFILLING POINTS
SUPPLY REFILLING POINTS
S.R.P.
A.R.P.
AMMUNITION REFILLING POINTS
AMMUNITION REFILLING POINTS
AMMUNITION REFILLING POINTS
SUPPLY SECTION OF MAINT. COY. R.A.S.C. (HEAVY LORRIES)
SUPPLY SECTION OF CAV. MAINT. COY. R.A.S.C. (HEAVY LORRIES)
SUPPLY SECTION OF CORPS TROOPS MAINT. COY. R.A.S.C. (HEAVY LORRIES)
3RD LINE
AMMUNITION SECTION OF MAINT. COY. R.A.S.C. (HEAVY LORRIES)
AMMUNITION SECTION OF CAV. MAINT. COY. R.A.S.C. (HEAVY LORRIES)
AMMUNITION SECTION OF CORPS TROOPS MAINT. COY. R.A.S.C. (HEAVY LORRIES)
1ST LINE TPT. OF A. A. BDE.
3" A.A. AMMUNITION
25 MILES
25 MILES
DIV. TROOPS
1ST BDE.
2ND BDE.
3RD BDE.
DIV. TROOPS
1ST BDE.
2ND BDE.
3RD BDE.
CORPS HD. QRS. SECTION
AIR DEFENCE BDE. SECTION
FD. BDE. R.A. SECTION
MED. BDS. R.A. SECTION
TANK BN. SECTION
S.A.A. & GRENADES
GUN SECTION 18 PDR. 4·5" 3·7"
S.A.A. & GRENADES
GUN SECTION 13 PDR.
S.A.A. SECTION
FD. BDE. R.A. SECTION
MED. BDE. R.A. SECTION
TANK BN. SECTION
AIR DEFENCE BDE. SECTION
18 PDR. 4·5" HOW.
6 HOW. 60 PDR.
6 PDR.
3" A.A. AMM.
SUPPLY RAILHEAD.
SUPPLY RAILHEAD.
SUPPLY RAILHEAD
S.R.H.
A.R.H.
AMMUNITION RAILHEAD
AMMUNITION RAILHEAD
AMMUNITION RAILHEAD.
※ This Fd. Bde. R.A. Section of the Corps Troops Ammunition Coy. R.A.S.C. has absorbed the 'B' Echelon of the A Fd. Bde. R.A. Ammunition Column.
9 These Units have absorbed the S.A.A. portion of the old Divisional Train and the 'B' Echelon of the D.A.C. and B.A.C.
† These Sections of the Corps Troops Ammunition Coy. R.A.S.C. are new links in the chain of Ammunition Supply of a Corps.


VEHICLES
MAINTENANCE REPAIRS (LOAD AND PASSENGER CARRYING VEHICLES FOR WHICH D.M.T. IS RESPONSIBLE)
EVACUATION & REPLACEMENT (LOAD AND PASSENGER CARRYING VEHICLES FOR WHICH D.M.T. IS RESPONSIBLE)
DIVISION
CORPS
EVACUATION
REPLACEMENT
1ST LINE REPAIRS (ROAD & GARAGE REPAIRS EFFECTED BY ARTIFICERS ON UNITS EST. & LIMITED TO 24 HOURS WORK)
DIVISIONAL TRAINS
AMN. COYS R.A.S.C.
NON R.A.S.C. UNITS.
MAINTENANCE COYS. R.A.S.C.
CORPS TROOPS MAINT. COYS. R.A.S.C.
CORPS TROOPS AMN. COYS R.A.S.C.
NON R.A.S.C. UNITS.
DIVISIONAL UNITS
CORPS UNITS
DIVISIONAL UNITS
CORPS UNITS
2ND LINE REPAIRS (MINOR REPAIRS AND REPLACEMENT OF PARTS LIMITED TO 4 DAYS WORK)
DIVISIONAL M.T. REPAIR COY.
CORPS TROOPS M.T. REPAIR COY.
FORMATION M.T. REPAIR COY.
FORMATION M.T. REPAIR COY.
ADVANCED M.T. VEHICLE RECEPTION PARK
ADVANCED M.T. VEHICLE RECEPTION PARK
L OF C. REPAIRS (MAJOR REPAIRS AND OVERHAUL OF VEHICLES)
BASE M.T. HEAVY REPAIR SHOP R.A.S.C.
BASE M.T. HEAVY REPAIR SHOP
BASE M.T. VEHICLE RECEPTION DEPOT
NOTE - IN THE CASE OF A NON-RUNNING VEHICLE, THE VEHICLE WILL BE EVACUATED BY THE FORMATION M.T. REPAIR COY. DIRECT TO THE FORMATION SUPPLY RAILHEAD, FROM WHENCE IT WILL BE DESPATCHED TO THE BASE.
NOTE. THE SYSTEM OF REPAIRS FOR VEHICLES OF A CAVALRY DIVISION IS THE SAME AS THAT FOR A DIVISION.

The R.A.S.C. units of each division and cavalry division are administered and controlled by the C., R.A.S.C., of the division and comprise :—

Headquarters, Divisional R.A.S.C.
1 Divisional Train (4 Companies) } Light Lorries.
1 Ammunition Company }
1 M.T. Repair Company.
1 Reserve H.T. Company.

The R.A.S.C. units belonging to corps troops are administered by the A.D.S.T. of the corps. These units together form the "Corps Transport Column" and normally consist of the following:—

1 Corps Troops Ammunition Company (light lorries).
1 Corps Troops Maintenance Company.
1 Corps Troops M.T. Repair Company.
1 Maintenance Company for each Division in the Corps.
1 Reserve M.T. Company.
1 Advanced Vehicle Reception Park.

The Ammunition companies in each division have taken the place of the S.A.A. section of the old divisional train, in addition to "B" echelon of the D.A.C. or B.A.C. in cavalry division.
The corps troops ammunition company has similarly absorbed the "B" echelon of the non-divisional field brigade, R.A., with new sections for carriage of medium brigade and 3-pr. ammunition.
The present medium brigade M.T. company and Tank Corps M.T. company have been abolished and in their place the corps troops maintenance company has been formed.
All 2nd-line mechanical transport which has to work in the forward areas now consists entirely of light pneumatic-tyred 30-cwt. vehicles, and all 3rd-line working in the rearward areas consists of heavy lorries (3-ton).

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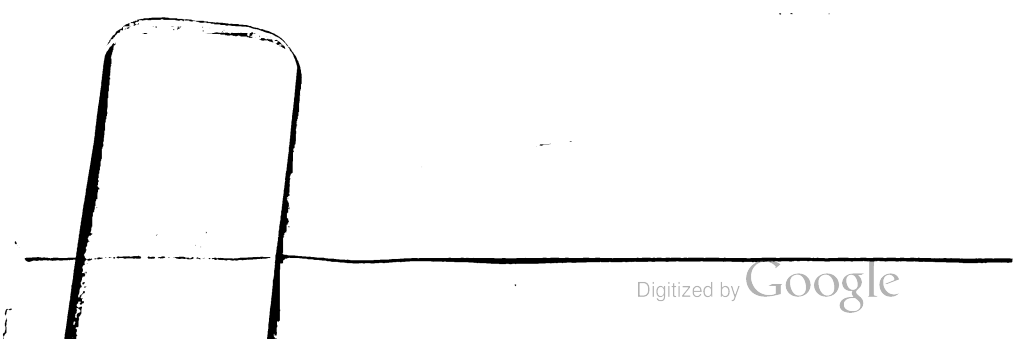

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THE STORY OF A GALLANT FIASCO, WALCHEREN, 1809.

By Major-General J. C. Dalton, Colonel Commandant, R.A.

THIS long-forgotten expedition which was the *baptême de feu* of so many splendid Gunners, commissioned in the first decade of the XIX century, has been given a chapter to itself by Col. Duncan in his "History of the Royal Artillery" who has largely used the "Journal of the Operations in the island of Walcheren" by that distinguished officer of the sister corps, Col. (later Sir John T.) Jones, R.E.[1] The list of R.A. Officers who took part in this campaign (see Appendix) which virtually only lasted for five months—August to December, 1809—appears in the Appendix which has been checked and arranged by Lt.-Col. J. H. Leslie, than whom there is no better authority. Jones gives a list of just under 50, but as Duncan points out, he omits the names of the officers with the Siege Companies, and others. I have therefore included in my list:—

(1) Those mentioned by Jones.
(2) Col. Leslie's list from the original Company Muster Rolls, and a few more taken from Duncan and Kane.

The total amounts to some 102, which do not include those of the Corps of R.A Drivers who were with the Field Brigades and Battering train.

Great Britain having command of the sea for the passage across the German Ocean was able to maintain safe communication and would no doubt have a stream of transports conveying reinforcements of men and officers to replace the large and increasing number of casualties, mainly due to disease.

As one of the many ambitions of the great Napoleon was to create a formidable maritime force in the River Scheldt, he, in 1809, having already obtained possession of the States General and placed his brother Louis Buonaparte on the throne of Holland, had established dockyards and arsenals in Terneuse and Flushing, and in addition to a fairly large and seasoned land force, had a well

[1] Whose able work "Journal of Sieges, etc." 2 vols, 1827, I have freely utilized.

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equipped and powerful fleet all ready and in menacing proximity to our eastern coast and mouth of the Thames.

The great River Scheldt after passing through Antwerp soon divides into two branches, the more northerly being called the Eastern and the other the Western Scheldt, and in the course of time had converted the country to the N.W. of Antwerp into numerous low-lying and swampy islands intersected by creeks some of which were fordable at low water and others navigable to vessels of varying size. The land being often of lower level than the sea had, and has still, to be protected from floods by a wonderful system of dykes and sluices.[1]

Strongly fortified towns and batteries commanded all the approaches to Antwerp where the French fleet had a snug anchorage and every advantage in the way of dockyards, arsenals and stores to maintain it in repair and equip it for sea. After Antwerp Flushing,[2] which is the most southerly point in the island of Walcheren, was the most important stronghold, and occupied a fine strategical position in the Western Scheldt commanding the channel across to the island of Cadsand which contained a garrison and some powerful batteries, the chief of which was at Breskens immediately opposite Flushing.

The British Government fully realised that an effort should be made to check the menace which kept the inhabitants of our eastern coast in constant dread of invasion, but the country had just got committed to a war with France in Portugal and Spain. However, our arch-enemy, in his insatiable lust for conquest, knowing that our hands were very full, determined on an invasion of Austria and, fortunately, withdrew the bulk of his efficient land force in Flanders to reinforce the army destined for his Austrian venture.

England therefore seized the opportunity "when the cat was away" to equip a strong invading land and sea force the object of which was "the capture or destruction of the enemy's ships, either building at Antwerp or Flushing or afloat on the Scheldt; the destruction of the arsenal and dockyards at Antwerp and Flushing; the reduction of the island of Walcheren and the rendering, if possible, the Scheldt no longer navigable for ships of war."

[1] See General Map No. 1.
[2] See Plan No. II.

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This ambitious plan of operations was by no means ill conceived from a strategical point of view, and presented great possibilities. The command of the invading army was vested in Lt.-Genl. the Earl of Chatham, then Master General of the Ordnance, whilst that of the coöperating fleet was bestowed on Admiral Sir Richard Strachan. Lord Chatham selected Brig.-Genl. John Macleod, D.A. General R.A., to be C.R.A of the force.

The fortresses of Antwerp and Flushing which were at this time in bad order and provided with weak and inferior Garrisons did not offer any serious prospect of resistance; also the French troops distributed over Holland, Walcheren, Brabant and Flanders to the number of some 10,000, were scattered and untrained.

According to Sir John Jones the force embarking consisted of one battery of R.H.A. (Macdonald's), 3015 Cavalry, 5 Brigades (batteries) of Field Artillery and 33,096 Infantry with two distinct equipments of siege ordnance and stores and due proportion of officers and men. Jones gives a list of the R.E. officers, the C.R.E. being Colonel Fyers. The R.E. Staff consisted of Capt. J. T. Jones (the historian of the siege) as Bde. Major, two Adjutants, and two Directors, Lt.-Cols. D'Arcy and Pilkington;[1] there were also 21 officers of R.E. distributed in 7 "brigades" and some 250 of the Corps of Royal Military Artificers. The fleet consisted of some 250 sail of various kinds including transports.

Briefly the plan of operations was:—

(1) The left wing of the army under Lt.-Genl. Sir Eyre Coote to land on the island of Walcheren near Domburg and lay siege to Flushing.

(2) A division 4900 strong under the Marquis of Huntly to land on the island of Cadsand and destroy the batteries of Breskens and thus free the channel for the fleet to pass up the Western Scheldt and cut off all succour being thrown into Flushing.

(3) A division of 7000 men under Lt.-Genl. Sir John Hope to land and occupy points on the south coast of the island of Schouwen and thus command the mouth of the Eastern Scheldt and the island of S. Beveland so as to prevent the

[1] Kane 694. After 22 months he was transferred to R.E., and died in 1834 a Col.-Commandant and I.G. Fortifications.

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batteries on those islands from annoying the transports on their way up the river.

(4) Two more divisions were embarked at Harwich of 5000 infantry under Lt.-Genl. Grosvenor to await orders, and 1000 cavalry and 3000 infantry under the Earl of Rosslyn to be in reserve.

It was calculated that within a week of leaving England the force intended for the reduction of Antwerp might rendezvous in the Western Scheldt within 10 miles of Antwerp.

But "*L'homme propose et Dieu dispose.*" On July 28, 1809, H.M.S. *Venerable* with the two C's in C. on board and escorting the transports convoying the Division of Sir John Hope, anchored about 9 miles off Dornburg in the full force of a westerly gale before which they were forced to weigh anchor and run for shelter to the Room Pot off the N. end of Walcheren where they anchored by 2 p.m. on the 29th.

The same gale drove the transports conveying the left wing of the army under Sir Eyre Coote from their rendezvous to the same refuge where they arrived on the 30th being joined next day by Lord Rosslyn's and General Grosvenor's Divisions. The Room Pot must have been full to the brim! There now remained the transports with Lord Huntley's Division on board which had arrived on the Dutch coast on the evening of the 28th but getting caught in the same gale were unable to find a safe anchorage in the Weilige Channel until the 31st, and this delay had given time to the enemy, who had a capable leader in General Monnet, to get considerable reinforcements over from Cadsand into Flushing. Consequently, what with the adverse weather and the defective means for landing large parties in face of the enemy, the landing on Cadsand had to be abandoned. It thus happened that Lord Chatham on the 3rd of August had missed his opportunity for getting his transports up the Western Scheldt and they had therefore to go round the island and join their comrades in the Room Pot arriving there on August 6.

To go back to the 30 July; the plans had of necessity been changed, and on that day Hope's and Coote's divisions were successfully put ashore on the Bree Sand with the object of reducing the island of Walcheren. The opposition was slight—the French

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abandoning the battery of Den Hauk—and our troops bivouacked on the sandhills 10 miles west of Flushing. The 71st Regiment came under fire from the town of Veer, losing 35 killed and wounded.

The garrison of Middleburg which was threatened, wisely decamped in the night and passed down the Sloe Channel into S. Beveland, leaving 4000 men under Genl. Monnet, distributed, 700 in Fort Veer, 120 in Rammekins and the rest in Flushing.

Fort Veer was important as being on the Sloe Passage which we required the command of so as to embark ordnance and stores from Room Pot for the investment of Flushing. General Frazer's division, assisted by a fire of rockets from the gunboats, invested and bombarded Veer, and Lt.-Col. Bogard, having embarked 200 of his best men in boats in the night to reinforce Flushing, surrendered on the morning of August 1 with 518 men.[1] Fourteen French gunboats at Veer escaped by the creek between N. Beveland and Wolfphartsdyk into the Eastern Scheldt and despite our efforts to intercept them got safely to Tholen.

On August 1, the force for the investment of Flushing had marched south through difficult country being harassed by the enemy at each village that it passed through, especially at Abeylan where the French lost several men and four guns before they were driven into Flushing. The British casualties were 15 officers and 279 men, of whom 1 officer and 45 men were killed and 34 men taken prisoner.

Next day a careful reconnaissance of Flushing was made; the land defences were not serious but there was a broad and unfordable ditch all round the *enceinte* which could be easily flooded at will by opening the sluices. Therefore it was not feasible to make a regular "attack" by land, so it was decided to rely on the disaffection of the inhabitants and the absence of bomb-proof cover and to bombard the place in the hope of inducing surrender.

Whilst waiting for siege equipment to come up, General Frazer's division was told off to reduce Fort Rammekins a few miles to the N.E. of Flushing which completely commanded and blocked the Sloe passage which was the only means of access for the

[1] Duncan mentions that two guns of Macdonalds Troop of R.H.A., and two 8" mortars were landed before Veer and their presence and, probably, fire no doubt decided the surrender.

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British transports to the Western Scheldt from Veer.

The defences of this work on the land side much resembled those of Flushing, and a site was fixed on for mounting at dusk three 24 prs. and two 10″ mortars at a range of about 700 yards. Some fighting took place between the sharpshooters of the garrison and of the 95th Rifle Corps (now the Rifle Bde.) and resulted in a surrender on August 3 which opened the sea passage for our ships and provided a secure base in S. Beveland.

Here the *Raven* sloop (Capt. Hanchett) performed an act of great bravery. In an endeavour to intercept some French boats coming from Cadsand to Flushing she exposed herself for four hours to a cross fire by artillery from both sides of the channel and appeared to be in momentary danger of being sunk. To the general joy of the anxious onlookers she escaped with only her Captain and seven men wounded.[1]

To go back to the 31st July, H.M. battleship *Superb* and transports of Sir J. Hope's division by judicious sounding managed to move up the eastern arm, anchored off Zierikzee and, next day, disembarked 2000 men near Kattendyk, 5 miles N.E. of Goes, which place was entered, and the British General Disney on his way to occupy Waarden on the W. Scheldt intercepted and captured 100 Dutch troops retiring from Middelburg.

From Waarden a force was sent to reconnoitre Bathz, an important place at the junction of the E. and W. Scheldt. The Dutch General Bruce, on the approach of the British, retired to Bergen-op-Zoom after spiking guns and destroying ammunition.

Bathz and neighbouring coast defences were occupied, and thus by the evening of August 2nd we had acquired all South Beveland and were practically in view of Antwerp. Eighty pieces of ordnance were captured in S. Beveland.

All this promised well for the chances of hustling the French into Antwerp with the small force of about 5000, which was all they then had time to collect, and for a speedy capture of that important fortress with the fleet and all the war material connected with it. In fact, an 18 miles march from Sandsvleit would bring the British before Antwerp.

[1] This reminds one of a somewhat similar performance by H.M.S. *Condor* (Lord C. Beresford) at Alexandria in 1882.

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Unfortunately the absence of boats on the part of the British and the presence of 30 French brigs of war in the river opposite Fort Bathz paralyzed our advance. A bombardment of that fort by the French ships, however, was soon replied to by five heavy guns, the vents of which our gunners had drilled out, which resulted in the retirement of the French flotilla.

On August 6 our navy had attempted to warp some armed vessels through the Sloe passage into the Western Scheldt, but were defeated by the weather, whereupon Admiral Sir R. Strachan recommended the Earl of Chatham to disembark his heavy guns and ammunition on the western dyke of S. Beveland and convey them by road to Bathz and then re-embark them there. Though the road was good and distance only 30 miles, it was calculated that the immense labour coupled with the difficulty of providing transport animals, etc., would take so long that it would be better to await more favourable weather for sea transport.

News now came to hand that the Garrison of Bergen-op-Zoom had been increased to 3000 men, and more were *en route* from Holland, and on August 8 the French flotilla, once more reinforced, returned to the attack of Bathz. But Capt. T. E. Wilmot, the C.R.A. there, after a three hours' bombardment, had poured in so destructive a fire with fourteen 24 prs. that the French were compelled to haul off. The Marquis of Huntly and his division, the infantry of Lord Rosslyn's and the brigades of field artillery disembarked next day in S. Beveland where they were cantoned.

On 10 August a French flotilla of six gunboats made a gallant and successful effort at high water to run up the narrow channel and over the ford under the guns of Fort Bathz and gained the Bergen-op-Zoom channel in the Eastern Scheldt. A second division tried the same game, but grounded, were fired on, and the crews "burned their boats" and decamped.

On August 11 Admiral Keats managed to take a flotilla of 10 small vessels and 40 gunboats through the Veer Gat into the Western Scheldt and anchored before Bathz, and at the same time 30 flat-bottomed boats each mounting a carronade arrived from the north by the Bergen-op-Zoom channel before which the French flotilla retired to Lillo. On this Admiral Keats formed his opinion that the enemy was now in a superior position by having the fleet

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behind him, and could drive Keats off by advancing in superior numbers on him as far as Bathz.

On 13th August the islands of Schouwen and Duiveland were occupied and a British garrison placed in Zericksee and on the same day Sir R. Keats reported that the fleet at Lillo had been further reinforced and had in addition 44 gun vessels between Tholen and Bergen-op-Zoom, and that though he did not anticipate their coming out from Lillo to attack him "he has abundantly the means so to do until a stronger (British) force arrives."

The French were now evidently consolidating their land forces and enrolling every man available to strengthen their position at Bergen-op-Zoom and Antwerp, also making preparations for flooding the country round those places by means of the defensive sluices, etc.

General Bernadotte had also arrived in Antwerp to take over the command.

To return to Walcheren: the operations for the siege of Flushing began on August 3. There were 17,000 men included in the divisions of Lord Paget, Generals Graham, Grosvenor, Frazer, and the reserve under Brig.-Genl. Houston.

The artillery preparations were as follows[1]:—Battery No. 1 for six 10″ mortars was started in the night 3-4 August, 1400 yards from the centre bastion. On August 5, No. 2 was laid out for ten 24 prs. to enfilade the left fronts. Bad weather hampered the work and 400 French troops got across from Cadsand to Flushing. A brisk fire was maintained on our working parties. The British losses up to 6th were 10 officers and 143 men killed and wounded. Owing to bad gales the navy had not yet been able to disembark the troops meant to land at Cadsand nor to blockade Flushing from the sea nor prevent the frequent reinforcement by the French of the beleaguered fortress, to the extent of bringing up its garrison by August 7 to a total of 5000 on which day a determined sortie was made by the Garrison against Genl. Graham's division which gallantly drove the enemy back with loss, the British casualties amounting to 8 officers and 143 men.

[1] Duncan who had consulted Sir R. Gardiner's Diary for this siege, points out a discrepancy in the numbering of these batteries, and that Jones' Nos. 5, 1 and 7 should read 1, 3 and 4. Each Division had a 6 pr. Brigade (battery) attached.

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The heat now began to tell on the besiegers who endured great hardships from exposure to the weather added to a defective commissariat, especially in the boats and bombvessels.

Napoleon had ordered the sea dykes to be cut which meant utter destruction to the country and the inhabitants, and was grudgingly and only partially obeyed by General Monnet who disliked the work. A new battery, No. 8, for six 24 prs., was built, specially to be manned by the seamen of the fleet, and was vigorously worked.

Jones's account details the siege batteries which on 13 August started the bombardment, viz. :—

No. 1	10″ mortars 6	Though it is not material to the history nor to the result, Capt. R. Gardiner, the Bde. Major, R.A., is probably right in the number he assigns to these batteries. (See footnote *ante*.)
,, 2	do. 4	
	24 prs. 10	
,, 3	do. 3	
,, 4	10″ mortars 4	
,, 5	24 prs. 13	
	8″ mortars 6	
	8″ howitzers 2	
,, 7	10″ do. 2	
,, 8	24 prs. 6	

These were assisted by batteries of rockets and two divisions of gun and mortar boats, and a *feu d'enfer* was poured into the devoted town which, though set on fire in several places, maintained a stout resistance and sank a mortar boat and disabled guns in our batteries. Though the besieging guns and gunboats ceased fire at night carcasses were fired from the mortars all night as well as rockets. The inundation being in progress and rising steadily renewed efforts were made to ensure surrender, and a new battery, to be called No. 10, for six 68 pr. carronades was started. Col. Fyers, C.R.E., was wounded at short range in the chest by a musket ball, but the violence of the blow was modified by passing through some sand. On 14 August the bombardment continued with so much vigour that the ammunition destined for the siege of Antwerp had to be indented on. On this day Sir R. Strachan, who was hindered by weather from helping on 13th, appeared with seven battleships to coöperate in the bombardment, and in the afternoon, as the town was "blazing furiously," Lord Chatham ceased fire and offered terms which were declined, so fire was resumed that night, and as the garrison was cutting the dykes to let in the sea and the effect of

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this move would be to flood most of the besiegers' batteries, an assault was directed on the outforts by 200 men under Lt.-Col. Pack who stormed a field work and advanced on the dyke, resulting in considerable loss to the defenders and 5 officers and 30 men to us, of whom one officer and 7 men were killed. This led to General Monnet sending an offer to submit, and next day officers of navy and army entered the fortress to arrange terms.

On *Aug. 18* the garrison marched out and laid down their arms, viz.: 2 generals of division, 200 officers and about 5000 others, some 600 being left in hospital. Over 200 pieces of ordnance and a corresponding amount of ammunition and stores fell into our hands. The batteries expended close on 10,000 rounds, the town was badly damaged and the civilian population suffered considerably.

The fleet was now anchored off Waarden and the troops began to suffer seriously from the "annual endemic fever" of the country.

On *Aug. 20* we had in S. Beveland 1500 in hospital, and Bathz became the H.Q. of the force. The French had pulled themselves together rapidly, had now collected an army of 25,000 to defend Antwerp and had flooded a large extent of the surrounding country.

On *Aug. 27* at a great British council of war the conclusion was come to "that the siege of Antwerp was impracticable and that no possible advantage would result from undertaking any minor operations." Measures were therefore taken to fall back on Walcheren.[1]

On *Aug. 29* British H.Q. was at Goes and the evacuation of S. Beveland, Schouwen, and N. Beveland commenced. The R.H.A., cavalry and horses of the battering train were first to leave and were soon followed by the companies of Wilmot, Buckner and Brome. The sick list mounted up with alarming rapidity through every corps, viz.: *28 Aug.* 4000; *3 Sept.* 7000; *4 Sept.* 8200; *23 Sept.* 9000; and weekly drafts of sick were being despatched to England.

[1] Col. Jones in his "Journal" dated 1827, though he alludes to the retirement from Bathz on Walcheren as a "failure which for a time clouded the prospects and dimmed the brilliancy of the British Arms" is nevertheless loyal to the two Commanders and says "Neither of the co-operating services ought in fairness to be charged with the blame of this delay." He attributes the failure to the weather, and implies that "had the elements favoured, instead of opposed, themselves to this armament, the results would have entailed as much panegyric as it has blame."

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By end of *October* only 4500 men remained for duty in the island of Walcheren, and General Don, who had succeeded to the command of the army, reported the island in a defenceless state, unable to cope with the French army in the field and barely able to hold on to Flushing. All, therefore, that was left to the British was to evacuate the island after destroying "the basin of Flushing and the naval defences of the island." The R.E., under Col. Pilkington, directed the work of demolition.

The complete evacuation of the island was effected by *23 Dec. 1809*.

Should students of these bygone campaigns, all of which "point a (valuable) moral and adorn a (useful) tale" desire further information they should read the very full details in the daily record kept so conscientiously and minutely by Sir J. Jones in his "Sieges."

Duncan[1] gives the artillery portion of the invading force at 16 companies, a battering train of 70 guns and 74 mortars, besides a liberal supply of Congreve rockets served by a heavy brigade (battery) of artillery under Capt. Stephen G. Adye. He also records that "Lord Chatham, observant though incapable" in his report on the surrender of Flushing gives the highest praise to the Royal Artillery who from being so exposed in the batteries had to bear the brunt, and suffered greatly from sickness.

Before the evacuation every fort was dismantled by the R.A. under the superintendence of Major W. Dixon and Capt. S. G. Adye. The former, writing to the D.A.G., R.A., on *3 Jan. 1810* (quoted by Duncan), specially commends Capts. Adye, Maitland, Light, Rawlinson and Macartney, also the Acting Adjutant, Capt. Anderson. His letter is most interesting.

An enormous number of captured guns were sent to England. The re-embarkation of the remnant of the British force was marked by shocking weather, and consequent discomfort, for the French had recovered sufficiently to be enterprising and naturally anxious to "speed the parting guest" in the most disagreeable way they could! So threatening had they become that two companies of artillery under Lt.-Col. Gold and Major Carncross were sent over to cover the re-embarkation and but for their moral effect (though

[1] Duncan had Sir R. Gardiner's diary to help him but his figures are apt to be queried, though not, I expect, to any serious extent, and histories compiled so long after the event must not be too critically dealt with.

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they never landed) it would have gone hard with Dixon's gallant but worn out detachment.

The destruction of Flushing, etc., was most complete, but the unfortunate gunners suffered grievously for want of proper food and warm clothing, the winter being bitterly cold, though fortunately it had killed the fever.

The story of Walcheren would not be complete were we to omit to mention that the capture of Flushing led to the withdrawal of the time-honoured privilege enjoyed by the artillery, viz.: that "the bells of a captured city or an equivalent" were claimed on behalf of the Regiment by the C.R.A. of the besieging force. When General Macleod laid claim to the bells of Flushing, the Mayor and Corporation, whilst acknowledging the justice of the claim, made an appeal *ad misericordiam* to be allowed to keep them, as they could never find money to replace them, nor to pay compensation. Genl. Macleod replied that he did not wish to add to the misery of the inhabitants caused by the nature of the French defence and was personally ready to sacrifice "his own rights and pretensions," still he could not compromise those of the Corps and therefore demanded a modified sum in order to mark the transaction and be able in a small degree "to contribute to the comforts of the officers and men who had partaken in the artillery duties of the siege." He claimed £500 and reduced the claim after more protest to £100, but the matter being referred to the British Government it disallowed the claim as being a relic of the days of pillage and decided it should not now be enforced, more especially as it concerned buildings set apart for Divine worship.

A modern guide book states that Flushing alone had 100 houses, two churches and a fine town hall destroyed in the bombardments and that this was "the sole and useless result of the English expedition to the island of Walcheren, undertaken by one of the finest British fleets ever equipped, the object of which was the capture of Antwerp."

The story of the expedition was well summed up by a local wag of the period:—

"The Earl of Chatham with sword drawn
Was waiting for Sir Richard Strachan.
Sir Richard, longing to be at 'em,
Was waiting for the Earl of Chatham."

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There can be no doubt that there was a distinct absence of harmony between the two leaders on land and sea which militated against that absolute and friendly coöperation which in any combined land and sea expeditions is so essential.

Duncan, with perhaps a prescience of what might happen and what did happen, 105 years later, remarks that the destruction of Flushing "for ever" as a fortress was of itself of great value.

APPENDIX.

ROYAL REGIMENT OF ARTILLERY.

Staff. Brig.-Genl. J. Macleod (436), in command of the Artillery of the Expedition.

Capt. P. Drummond, A.D.C. (738).

,, R. H. Gardiner, Bde. Major (979).

Lt.-Col. G. Cookson, Comdr. R.A. Divn. (566).

Capt. Hon. W. H. Gardiner (766), A.D.C. to Earl of Chatham.

Field Officers and Companies of Artillery.

Col.	C. Terrot	(496)
Lt.-Col.	G. W. Dixon	(594)
,,	G. A. Wood	(664)
,,	T. Franklin	(684)
Major	C. Waller	(696)
,,	T. Griffiths	(706)
,,	W. Dixon	(710)

N.B.—The above names appear in Jones "Sieges."

(Nos. in brackets refer to Kane's List, 1899.)

COMPANIES OF ARTILLERY.

Here follow lists by Lt.-Col. J. H. Leslie taken from Muster Rolls and annotated, showing the present designations of the companies and units concerned, and containing 80 names.

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ROYAL HORSE ARTILLERY.

H. TROOP.

July, 1809. Stationed at Warley, Essex.

Captain	Alexander Macdonald	(785)
2nd Captain	William Dan Nicholls	(1034)
1st Lieutenant	William Pakenham, Staff Officer to Macdonald	(1226)
,,	Archibald Montgomery Campbell	(1273)
,,	George Brodie Fraser	(1243)

19 August. Middleburg.

Three officers, Nicolls, Fraser and Campbell, are shown as "on board ship." It is presumed that Macdonald and Pakenham were "on dry land."

Nothing is said as to embarkation or disembarkation, but the fact that the Troop was at Middleburg on 19 August shows that it must have disembarked some time during that month.

10 September. Warley.
1816. Title changed to "G" Troop.
1819. Troop reduced.
1857. Reformed as "G" Troop, R.H.A.

1926. "H" Field Battery, R.A.

2ND BATTALION.

July, 1809. Stationed at Chatham.

Captain	Joseph D'Arcy	(894)
2nd Captain	William Greene	(1105)
1st Lieutenant	James Archibald Chalmer	(1222)
,,	Mark Evans	(1413)
2nd Lieutenant	George Spiller	(1419)

8 July. Embarked at Portsmouth on board H.M. Ship *Orion*.
31 July. Disembarked on the Island of Walcheren.
4 September. Ter Veer. Walcheren.
13 October. Embarked for England.
December. Stationed at Chatham.

1926. 16 Medium Battery, R.A.

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2ND BATTALION.

July, 1809. Stationed at Ipswich.

Captain	Thomas Paterson	(930)
2nd Captain	Matthew Lord	(1102)
1st Lieutenant	James Robert Colebrooke	(1308)
,,	Henry Finlay Cubitt	(1310)
2nd Lieutenant	Richard Kendall	(1432)

17 July. Company embarked.
August. Off Campvere.
8 September. Re-landed in England. Stationed at Colchester.
1819. Reduced.
1895. Re-formed as 38 Company, Southern Division, R.A.
1926. 42nd Heavy Battery, R.A.

3RD BATTALION.

July, 1809. Stationed at Sevenoaks.

Captain	Joseph Brome	(824)
2nd Captain	James Pattison Adye	(1047)
1st Lieutenant	*Hon.* Mark. Somerville	(1164)
,,	Philip Sandilands	(1345)
2nd Lieutenant	Edward Davis Baynes	(1441)

16 July. Embarked on board *Cumberland* Transport at Woolwich. Brome, Somerville, Baynes, 7 N.C.O's, 61 Gunners and 2 Drummers.
Embarked on board *Stagg* Transport at Woolwich. Adye, Sandilands, 6 N.C.O's and 40 Gunners.
9 August. The whole Company disembarked at Sloe passage.
3 September. Embarked at Hoodenskirk.
October. Stationed at Sevenoaks.
1926. 12 Heavy Battery, R.A.

3RD BATTALION.

July, 1809. Stationed at Norwich.

Captain	Alexander Campbell	(819)
2nd Captain	Daniel Jones Skelton	(1119)
1st Lieutenant	Samuel Charters	(1246)
,,	Edward C. Vinicombe	(1370)
2nd Lieutenant	Thomas Wynn	(1421)

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17 July. Embarked at Gravesend.
11 August. Disembarked at Ter Veer.
20 August. Re-embarked at same place.
8 & 9 Sept. Disembarked at Harwich.
September. Stationed at Colchester.
1926. 12th Field Battery, R.A.

3RD BATTALION.

July, 1809. Stationed at Woolwich.

Captain	Percy Drummond	(788)
2nd Captain	Charles Freeman Sandham	(1022)
1st Lieutenant	William Bolden Dundas	(1150)
,,	Forbes Macbean	(1228)
2nd Lieutenant	William Henry Bent	(1449)

16 July. Embarked at Woolwich.
1 to 11 Aug. Disembarked at Walcheren.

Officers.	*N.C.O's.*	*Gunners.*	*Drummers.*	*Total.*
5	13	99	2	119

Embarked at Ter Veer 20 August, 1809.

	Officers.	*N.C.O's.*	*Gunners.*	*Drummers.*	*Total.*	
12 Sept.	4	10	81	2	97	Disembarked
14 ,,	—	1	5	—	6	at Woolwich.
16 ,,	1	2	13	—	16	

September. Stationed at Woolwich.
1926. 10th Pack Battery, R.A.

3RD BATTALION.

July, 1809. Stationed at Colchester.

Captain	Peter Fyers	(756)
2nd Captain	John Richard Orlebar	(1077)
1st Lieutenant	Edward Coxwell	(1304)
,,	Phipps Vansittart Onslow	(1400)
2nd Lieutenant	John Mercier	(1441)

17 July. Embarked at Gravesend on board the *Alexander* Transport.
September. Stationed at Colchester.
1819. Company reduced.

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1848. Company reformed, as No. 9 Company, 2nd Battalion, R.A.
1926. 7th Field Battery, R.A.

3RD BATTALION.

July, 1809. Stationed at Portsmouth.

Captain	Henry Marsh	(810)
2nd Captain	Charles David Maitland	(1118)
1st Lieutenant	Henry Curtis	(1181)
,,	John Edward George Parker	(1223)
2nd Lieutenant	Josiah Grant	(1254)

16 July. Embarked for Flushing.
December. Stationed at Flushing.
January, 1810. ,, Woolwich.
1819. Company reduced.
1848. ,, reformed, as No. 10 Company, 3rd Battalion.
1926. 8th Field Battery, R.A.

3RD BATTALION.

July, 1809. Stationed at Eastbourne.

Captain	Thomas Rogers	(884)
2nd Captain	Thomas Alston Brandreth	(990)
1st Lieutenant	Philip Warren Walker	(1168)
,,	James Evans	(1218)
2nd Lieutenant	George Birch	(1418)

July, 1809. Stationed at Flushing.
November. ,, St. Joos Land.
December. ,, Woolwich.
1926. 8th Heavy Battery, R.A.

3RD BATTALION.

July, 1809. Stationed at Woolwich.

Captain	Edward Wilmot	(912)
2nd Captain	Robert William Gardiner	(979)
1st Lieutenant	James Sinclair	(1207)
,,	Thomas Robert Cookson	(1409)
2nd Lieutenant	Edward Jacob Bridges	(1438)

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16 July. Embarked at Woolwich.
4 August. Landed in the Island of South Beveland.
Disembarked at Woolwich—

	Officers.	*N.C.O's.*	*Gunners.*	*Drummers.*
10 September	5	1	23	—
11 ,,	—	10	53	1
14 ,,	—	2	22	—

September. Stationed at Woolwich.
1926. 14th Field Battery, R.A.

5TH BATTALION, R.A.

July, 1809. Stationed at Canterbury.

Captain	Stephen Galway Adye	(752)
2nd Captain	Arthur Macartney	(1037)
1st Lieutenant	William M. Miller	(1153)
,,	Charles Dalton	(1305)
2nd Lieutenant	Hugh Morgan	(1459)

7 July. Embarked at Portsmouth for Walcheren.
1 August. Disembarked there.
September. East Zouburg.
October-November. Flushing.
Returned to England by Detachments, sick (dates not known).
December. Stationed at Woolwich.
1926. 1 Medium Battery, R.A.

5TH BATTALION.

July, 1809. Stationed at Woolwich.

Captain	Richard Buckner	(746)
2nd Captain	Henry Light	(1049)[1]
1st Lieutenant	James Thorndike	(1347)
,,	John S. Rich	(1411)
2nd Lieutenant	Hillebrant Meredith Parratt	(1445)

[1] Captain H. Light (1049), later General Sir Henry Light, K.C.B., wrote a popular and stirring story of Walcheren and its hardships, which he published in Blackwood's Magazine for September, 1910. After returning home with his unit in September he volunteered to go back to help to "clean up" and was wrecked, but landed, and describes his experiences. J.C.D.

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16 July. Embarked—3 Officers, 58 N.C.O.'s and men, on board the *Freelove*, No. 41, and 2 Officers and 57 N.C.O's and men, on board the *Stagg* (B.U.) Ordnance Transports.

5 September. On board the *Anacreon*—Room Pots off North Beveland.

15 September. 58 men landed at Woolwich.
14 ,, 16 ,, ,, Chatham.
9 ,, 38 ,, ,, Deal.

October. Stationed at Woolwich.

1926. 22nd Heavy Battery, R.A.

9TH BATTALION.

July, 1809. Stationed at Chatham.

Captain	J. George Massey	(853)
2nd Captain	Thomas Fead	(1121)
1st Lieutenant	William Robinson Grant	(1295)
,,	Charles Strangeways Torriano	(1314)
2nd Lieutenant	Charles Drawbridge	(1458)

8 July. Embarked.
August to November. Walcheren.
December. Stationed at Canterbury.
1926. 44th Field Battery, R.A.

9TH BATTALION.

July, 1809. Stationed at Canterbury.

Captain	Alexander Munro	(886)
2nd Captain	Henry Alexander Scott	(1104)
1st Lieutenant	John James Chapman	((1279)
,,	Charles Ford	(1342)
2nd Lieutenant	John Street	(1443)

3 July. Embarked.
December. Stationed at Canterbury.
1819. Reduced.
1897. Re-formed as No. 41 Company, Southern Division, R.A.
1926. 33rd Heavy Battery, R.A.

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9TH BATTALION.

July, 1809. Stationed at Canterbury.

Captain	Nathaniel Wilmot Oliver	(944)
2nd Captain	Peter Wallace	(983)
1st Lieutenant	George Pringle	(1296)
,,	William Anderson, Adjt.	(1394)
2nd Lieutenant	Thomas Trench	(1457)

3 July. Embarked in H.M.S. *Monarch*.
November. Stationed at Canterbury.
1926. 82nd Field Battery, R.A.

9TH BATTALION.

July, 1809. Stationed at Chatham.

Captain	James Webber Smith	(877)
2nd Captain	John Boteler Parker	(1117)
1st Lieutenant	Thomas D. Jones	(1248)
,,	George Browne	(1395)
2nd Lieutenant	Samuel Phelps	(1417)

8 July. Embarked, Portsmouth, in H.M.S. *Orion*, 74 guns.
31 ,, Disembarked, Walcheren.
December. Stationed at Chatham.
1906. Company reduced, then being No. 92 Company, Royal Garrison Artillery. Not re-formed.

Certain other names appear in Kane's List of Officers credited with the Walcheren Campaign other than those enumerated in the sixteen companies as per Col. Leslie's list above.

They are as follows:—Lt.-Col. C. Gold (718,) Maj. J. H. Carncross (727), Capts. C. Younghusband (832), J. Addams (924), T. G. Browne (1093), W. Z. Lloyd (922), G. J. Rawlinson (1041), specially mentioned in connection with the final dismantling under S. G. Adye, J. Marlow (1109), W. Cator (1134), and Lieuts. J. S. Law (1393), praised in connection with the evacuation, R. S. Armstrong (1407) and G. A. Moore (1410).

To recapitulate therefore as to numbers:—

Staff. 5, including two, R. W. Gardiner and P. Drummond, who come into List A. =3.

Field Officers. 7.

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No I

LOW COUNTRIES 1809
VOORNLAND
BEIERLAND
GOEREE
OVER FLAKKEE
SCHOUWEN
DUIVELAND
THOLEN
WALCHEREN
SOUTH BEVELAND
MIDDELBURG
Flushing
Weilinge Channel
West
East
Scheldt
Sluis
BRUGES
Ostend
GHENT
ANTWERP
Bergen op Zoom
Breda
Zevenbergen
Rozenthal
Willemstad
Klundert
Philippine
Sas de Gand
Hulst
Axel
Terneuse
Tamise
St Nicholas
Dendermond
Vilvoorde
BRUSSELS
MALINES
Thielt
Dijnse
Nevele
Oudenburg
Ghistel
Ardenburg
Damme
Eeclou
Waevahote
Uzacle
Deynze
Deurle
Oordighem
Audenarde
Lierre
Contich
Rupelmonde
Boom
Lokeren
Wetteren
Quadrecht
Ghent
Aeltere
Evergem
Heyst
Mollem
Laken
Zaschе
Andevelt
Overmeere
Opwyk
Wilde
Liedekerke
Hadtery
Eyke
Eyghem
Pamele
Vinderhoute
Desatel
Moerbeke
Meerem
Wommelgem
Borsbeke
Berchem
Horstel
Hoboken
Waerloos
Duffel
Ruremonde
Borrenbeek
Ruysel
Wilmerdonk
Callao
Tête de Flandre
Beveren
Zaamslag
Philippine
Sas de Gand
Sluis
Ardenburg
Oostburg
Breskens
Cadzand
Nieuwvliet
Biervliet
Ijzendijk
Knoke
Bouchaut
Aszendede
Moerbeke
Mendonk
Adeghem
Eeclou
Waevahote
Syzacle
Uzacle
Vinderhoute
Desatel
Overmeere
Appels
Opwyk
Wetteren
Quadrecht
Ghent
Aeltere
Nevele
Eyghem
Pamele
Deurle
Oordighem
Audenarde
Thielt
Dijnse
Eyke
Hadtery
Wilde
Liedekerke
Andevelt
Brussels
Laken
Mollem
Zaschе
Boost
Lierre
Contich
Rupelmonde
Boom
Lokeren
Wetteren
Quadrecht
Ghent
Aeltere
Evergem
Heyst
Opwyk
Overmeere
Appels
Dendermond
Vilvoorde
Malines
Hauine
Tamise
St Nicholas
Rupelm

No. II.

Attack
OF
FLUSHING
Between the 3d & 15th of August
1809.
Bridge
No. 8
No. 9
No. 7
No. 1
No. 6
Piquet
Traverse
Paved foot-path to West Zoubourg
Great Road to Middlebourgh
Knolle Point
No. 10
Old Flushing
Basin for men of war
Dock Yard
French advanced Battery stormed
Cut made to admit the Sea
No. 3
No. 4
WEST SCHELDT

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ASTOR, LENOX, AND
TILDEN FOUNDATIONS

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Company Officers. See List A. 80.
Unattached Officers. Names mentioned in Kane's List and Duncan's History. 12.

Grand total. 102.

From the Chatham papers (P.R.O.), Vol. 2621, we find that

The following Brigades of Artillery under Lt.-Col. Cookson are attached,

Buckner's to Right Wing.
Broome's ,, 2nd Div :
Wilmot's ,, Reserve.

H.Q., Ramsgate.
23 July.

The troop of Horse Artillery, Capt. A. Macdonald, attached to the Light Troop, Rt. Wing.

H.Q. on board
H.M.S. *Venerable*,
28 July.

Ships' names.
Monarch
Resolution
Bellona
Illustrious
Orion
} There were detachments of Artillery on each of these boats.

St. Domingo,
Off Alvoet's Dyke,
2nd Sept., 1809.

Sir,

Lord Chatham having in the most earnest manner prest for the Army being embarked from South Beveland I have consented to that measure taking place on Monday next . . . I deem it however an indispensable part of my duty to be with the Rear upon this occasion and shall return with the flood to Bathz in a cutter and hoisting my Flag on one of the Ships attached to the Gunboats and arm'd flotilla under Capt. Cockburn.

(sd.) Rd. J. STRACHAN.

The superscription on the above I do not know, but this letter from the Admiral in chief command is interesting.

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ROYAL AIR FORCE AND ARMY CO-OPERATION.

THE OTHER POINT OF VIEW.[1]

BY SQUADRON LEADER J. C. SLESSOR, M.C., ROYAL AIR FORCE.

(The opinions expressed in this article are only the personal opinions of the writer and do not necessarily represent the views of the Air Staff.)

THE article in the January number of the Royal Artillery Journal by Major R. G. Cherry, M.C., voices a point of view based on premises which we in the Air Force, in common with many soldiers, hold to be unsound. And it is the purpose of this article to put forward the other point of view, that of the airman who has the interests both of the R.A.F. and of the Army at heart, to argue with the premises which we hold to be false and to explain our reasons for that opinion. It would be tedious to attempt to take Major Cherry's article and argue with it sentence by sentence; but before going on to give a personal indication of the other point of view, there are one or two statements in his article which are definitely misleading and which should not be allowed to go unchallenged.

The first is that "The actual art of flying an aeroplane can be taught in a few weeks to nearly any young, fit and active soldier." It is true that a young officer could be taught enough of flying in a few weeks to enable him to take an aeroplane off and land it again without breaking his neck. But it is a far cry from this somewhat rudimentary stage in the training of an airman to that state of instinctive skill required by the army co-operation pilot. Flying is not a black art, but like most other accomplishments, it requires constant and considerable practice before a pilot is really proficient; if an officer is to give anything like full value as an observer, in which occupation his whole time must be devoted to watching the ground, following his map, using his wireless, and so forth, the

[1] See R.A. Journal, Volume LII, No. 4, page 548; and Journal of U.S.I. of India, Volume LV, No. 241, page 33.

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actual flying of the machine must not cost him a thought. It must be instinctive, and this only comes with practice. And this raises an extremely important point which must be borne in mind whenever the subject of this article is considered. Major Cherry quite rightly concludes that the observer must also be the pilot. If then the pilot is to be an army officer, a gunner, he must have constant flying practice to keep him up to the mark as a pilot. How is this going to be done, for instance, under the conditions outlined in Major Cherry's solution (c)? How are the major or captain and two subalterns of each medium or heavy battery to get sufficient flying practice to render their flying instinctive? It is difficult enough for the squadron leader of an Army Co-operation Squadron, let alone for the major of a heavy battery.

In this connection, on another page Major Cherry gives the misleading impression that it is possible to do a reconnaissance after two hours' flying. Certainly in the last war officers were sent on reconnaissance after a very short air experience, but with all respect it cannot be claimed that their reports were often much use. But reconnaissance under conditions of moving war, with troops trained on modern lines, is infinitely more difficult than it ever was under static conditions. It is axiomatic that to be of any use as an observer an officer must have very considerable practice in looking at troops and the movements of troops from an unwonted angle from the air. This is the case in peace, and its importance is redoubled when it comes to war, with its altered moral and physical conditions.

One further inaccuracy needs correcting, which is probably a slip of the pen. Major Cherry states that our present organisation allows one squadron per corps; this was the case during the last war, and was amply sufficient for the needs of static war, but the present organisation in England is one Army Co-operation Squadron to each Division. Which is what Major Cherry demands.

Major Cherry writes as a gunner, and his article deals mainly with the problems of air-artillery co-operation. But it is called "Royal Air Force and Army Co-operation," and it raises one point which is of the utmost importance and should be clearly understood. It is stated that, at least in the early stages of the campaign, and "owing to the importance of the work and the difficulty of

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training Air Force observers in peace, the Army Commanders would prefer to send up staff officers who know the strategical position and who at the same time have been trained to carry out observation from the air." In passing it should be observed that it should on the face of it be less difficult to train Air Force observers than Army Staff officers in peace, and that the time when you really will be able to count on good and reliable air information from Air Force observers will be in the early stages of a campaign before the really skilled and experienced observers become casualties. However, the important thing to consider is the point of view which gives rise to the statement quoted; it is a point of view very widely held, and at the bottom is based on a fallacy, namely, that it is possible to make reliable deductions in the air. *It is not only impossible, but it is excessively dangerous.* This is not a point of view, but a statement of absolute fact. In a naval battle, and possibly in some parts of a few open treeless sandy countries like Palestine or 'Iraq, you do get the panoramic view from the air, and it may be possible to make accurate deductions from what you see, but under European—and most other— conditions, you absolutely definitely cannot. And for this reason the R.A.F. observer must be, and is, trained to report exactly what he sees; he must have a knowledge of Army formations, and of how the Army works, in order to help him identify what he sees. But the moment he tries to draw deductions, and to report tactical or strategical situations he, and any other observer whatever his rank or service, becomes a public menace. Major Cherry quite rightly says that air information must be supplemented by, and compared with, information supplied by the older forms of reconnaissance; and to attempt to size up a situation, on however small a scale, without the aid of those other sources of information and without the close personal touch only possible on the ground, is to court trouble. Even in open moving war the air observer, however skilled he may be, fails to see so much that is important, and perhaps unconsciously he attaches such importance in his own mind to what he does see, from the mere fact that he has seen it with his own eyes, that his estimate of the general situation will probably more often than not be so distorted as to be almost unrecognisable when compared to a review of the actual situation. When finally it is

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considered how much reliance—from psychological reasons—a commander is bound to place on the report of one of his own staff who has seen with his own eyes, it will be realised how terribly dangerous such a proceeding may be. There was a case of this in the last manœuvres. A senior staff officer, with considerable air experience, did a reconnaissance in an aeroplane; his report of the situation, based on a quite naturally exaggerated estimate of the importance of what his eyes had seen, and neglecting what he had inevitably missed seeing, was so inaccurate as to have been almost fatal had it been believed against the words of the experienced Air Force observer.

It may be argued that this is a temporary condition, that as observers become better trained, especially in military knowledge, and as we become more accustomed to the conditions of moving warfare, it will become possible more accurately to size up a situation from the air. But on the contrary, all recent experience tends to confirm the view that the reverse is the case, and that it will become more, not less, difficult to make an accurate estimate of the trend of events on the ground from air observation alone. Not only are modern troops becoming exceedingly well trained at concealment, but another factor is being introduced. It is the old story, that for everything that threatens to revolutionise war, an antidote is found: as air reconnaissance became more efficient it began to look as though here was a revolution in war; we could see the other side of the hill at last, and at any rate strategical surprise looked like becoming a thing of the past. Concealment of large bodies of troops on the move is impossible, troops cannot continually move at night and fight by day, and constant concealment measures tend to slow up movement to an impossible degree. But the antidote to air reconnaissance is now apparent, and the answer is *Deception*. Well thought out, carefully organised deception can be easily and economically carried out, and will defeat the air observer every time. As well as a certain amount of concealment, deluding the observer into thinking that an area is not occupied by troops, we (and other armies) will now practise deception, deluding him into thinking that an area is occupied. With 50 men, a few horses and limbers, the artistic use of smoke, and perhaps an obsolete tank to make tracks into woods, it would

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be possible to simulate a dummy occupied area which not even the most skilled and experienced observer in the world would be able to distinguish from the real thing. It is unnecessary to labour the obvious point that all this increases tenfold the importance of the observer reporting only exactly what he sees, leaving it to the staff on the ground to make the deductions. "Four limbers half concealed under trees here—this village apparently occupied, a few men seen moving round mosque—5 or 6 small puffs of smoke coming out of wood here—apparently tank or dragon tracks there—" and let the man in the Divisional or Corps office who has all the other clues, all the other sources of information at his finger tips, decide whether the missing enemy brigade really is in the area, or whether it is only deception.

Turning to the artillery side of the picture, many of the arguments against the artillery officer controlling the fire of the battery from the air have been, as Major Cherry says, ably set forth in the Air Ministry memorandum to which he refers, and there is no need to repeat them here. But it is necessary to point out that very much the same arguments apply to this question as to that discussed above. The man in the air is only able to see the situation from one point of view, which is a very detached one. He has no direct contact with the situation on the ground, or with the minds of the various commanders who are directing it. Major Cherry himself produces excellent arguments against tactical control from the air of light artillery supporting an infantry attack, and it is difficult to see what case he has made for fire control from the air in any other circumstances. He admits that hostile reserves, transport, and guns will be distinguishable from 3000 feet, but he does not explain what is the matter with the present method of dealing with such targets. If the pilot of the artillery machine sees these targets (and if he does not, there is no reason why a gunner officer should) he will report them and offer to observe fire on them, by one of the usual methods such as A.N.F., B.N.F., or F.T.G. call. It will then be for the C.R.A., or at least the Brigade Commander on the ground—not an isolated captain in the air—to decide in the light of his knowledge of the situation on the ground which of the proffered targets to fire on, and the air observer will then inform him, or the battery commander con-

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cerned, by W/T—not R/T for Heaven's sake—where his rounds are falling.

A word about radio-telephony (R/T), which Major Cherry says now provides a medium for controlling artillery from the air. It has a very attractive sound, that word "telephony," but it is full of snags. R/T instruments are delicate and difficult to operate, and the jamming properties of R/T are bad; at present it is used only by the close reconnaissance patrol, but the tanks are experimenting with it, and it has been tried by the artillery. But anyone who had any experience of it during the last manœuvres, when all the wireless resources of a comparatively large force were in action, will remember the chaotic condition of the aether at that time and will view with dismay any threat to increase the amount of R/T speech that must fly about. It is true that R/T for military purposes is only in its infancy, but it is probable that for a long time to come, and possibly for ever, wireless telegraphy and the morse code will be a quicker and more reliable method of communication than R/T. W/T is speedy, can be easily adapted to a code, its jamming properties are not so bad as those of R/T, and W/T signals can be distinguished from among a mass of other wireless traffic when R/T speech at anything but very close range would be quite indistinguishable. Therefore let us not embark too lightly upon R/T for the artillery; otherwise the end will be that by attempting to use too much R/T we shall be unable to use any, and that would be a disaster.

The foregoing is an attempt to indicate "the other point of view" of the subject as a whole. Before closing this article there are one or two minor points in Major Cherry's article which it may be of interest to consider from another angle.

(a) Major Cherry considers it will be necessary to have six machines continually in the air operating with the artillery allotted to a division, in addition to balloon observation. Add to this one, or probably two, close reconnaissance machines in the air all day, and we arrive at a total of eight machines in the air at once. Not only is it definitely impossible, from a wireless point of view, to work eight machines at once on a divisional front, but also it would require nearly three squadrons to do it. One squadron can only be counted on, in the summer, to keep three machines continually

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in the air from dawn to dusk, with an occasional additional machine for some special work such as photography. This figure might be increased to four in good weather at mid-winter when the days are short.

(b) Many will sympathize with Major Cherry's plea that the Air Force should "specialise seriously" in army co-operation. But on this subject again there is the "other point of view." One of the most difficult problems that faces an air force is the question of reserves to replace casualties in war. This problem cannot be solved for the army co-operation squadrons by seconding many young officers from the army; the army will not be able to afford to send off a large proportion of its younger officers as reserves to the Air Force, and indeed by the time these young officers are needed to replace casualties in army co-operation squadrons they may well be casualties themselves. The sources of supply of casualty replacements for the army co-operation squadrons in war will be firstly, the Reserve of Air Force Officers, which contains an increasing number of experienced army co-operation pilots, who will only need a little polishing up when war breaks out to make them efficient again; and secondly, the rest of the R.A.F., the Home Defence Force especially. Therefore our policy is to build up in the R.A.F. Reserve a good body of pilots who have done their short service time with army co-operation squadrons, and rather than make a permanent officer spend his whole career in army co-operation, we should only keep him till he is thoroughly trained, and perhaps a year longer, and then send him away from army co-operation altogether, to the Home Defence Force, and train others in his place. So that that force will in time contain a certain number of trained army co-operation pilots who may be available to replace casualties in the expeditionary force. It is no good having a small super-efficient body of specialists with few or no trained reserves behind them.

As to the danger, to which Major Cherry refers, that army co-operation pilots may be called on in a national emergency for Home Defence, this presumably is possible, and is rather beyond the scope of this article. But if a national emergency arises so serious as to demand the calling in of army co-operation pilots to re-inforce the Home Defence Force, surely the Cabinet will order

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that every man who can fly, be he soldier, sailor, tinker or tailor, is devoted to that end. If the emergency is not sufficiently serious then the army co-operation squadrons will not be touched in any case, and there is no need to worry about it.

(c) Although it is of great importance that army co-operation pilots should have a thorough knowledge of the army, yet it is possible to make exaggerated claims in this respect. The subaltern officer seconded from the army to the Air Force makes a good army co-operation pilot-observer; but on the whole he does not usually make a better one than his brother officer from Cranwell or on the Short Service List. Nor as a matter of fact does the average seconded gunner subaltern make a better artillery observer. This is only the personal opinion of the writer, but it is based on considerable experience of army co-operation both in peace and war.

Finally, let us not come to expect too much of air observation. It is of the very greatest value, and without it an army to-day would be like a man groping in the dark, but it has its very definite limits, and it is probable that we have nearly reached them. We cannot do everything from the air, it is even now a complicated job, and we must look for simplification. As Major Cherry so rightly says, the system must be fool-proof, or it will break down under the test of war. Let us remember that as fighting services we exist for war and that the systems we evolve to-day will have to be worked under more difficult circumstances by the far less highly trained personnel who are bound to have to succeed and reinforce us after a few months of war.

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ARTILLERY ORGANISATION.

II.

[*Translation by Brig.-Genl. W. Evans*, C.M.G., D.S.O., *of the second part of* "Organisation rationelle d'un système d'Artillerie," by Commandant Buchalet. *Revue d'Artillerie, September, 1925.*

Chapter V.—The Need for a new Grouping of Guns.

The Battery the Technical Unit.

AS stated in Part I of this article the present organisation of guns in *groupes*, batteries, etc., dates from a time when wireless and aviation were in their infancy, and batteries were commanded by voice. No wonder that artillery of the present day is deficient in power of manœuvre. If artillery is unable to maintain the volume of its fire when supporting advancing infantry, initial successes cannot be exploited. The following are the principal reasons for this diminution in the volume of fire.

(1) Failure of signalling communications and observation.
(2) Inaccuracy of fire of batteries after changing position.
(3) Resting guns to prevent overheating.
(4) Inaccuracy of fire of batteries remaining in back positions.
(5) Moving batteries.

(1) Failure of signalling communications.

The system of observation and communication works perfectly at the commencement of an attack. The positions of the various troops working in liaison are known (command posts and O.P's of artillery and infantry). The system becomes dislocated as soon as the attack has made any progress, and the difficult task of establishing a new one commences. Artillery support becomes difficult to obtain, or ceases altogether, liaison with the infantry is lost, and they are left entirely dependent on their own weapons. This is why the infantry urge that the accompanying guns should belong to them and work with them. The artillery of direct support should be allotted extra personnel for observation and liaison.

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Observation and liaison detachments have a difficult and dangerous task, and should not be kept for ever in the line but should be relieved with the infantry.

(2) Inaccuracy of fire of batteries that have moved.

The fire of batteries that have moved during battle is less accurate than that of guns remaining in their old positions as time was not available for accurate survey work and registration cannot be carried out. This can be got over by always trying to get observed fire, or at any rate controlled fire. It should be possible by co-ordinating the maps of the staffs of regiments and *groupes* with the firing maps to ensure accuracy in the preparation of series fired by the map. The main point is that the observation detachments of the units of the divisional artillery should be capable of acting independently of liaison detachments. But even given the importance of observation, support asked for by the infantry must be independent of it. It often happens that circumstances that favour an infantry attack (fog, dead ground, etc.) entirely prevent direct observation. Therefore unobserved fire must be resorted to.

(3) Resting guns to prevent overheating.

This becomes much more serious the higher the initial velocity of the gun firing. Experiments in rapid fire during the war have established a maximum rate for each nature that must not be exceeded. It would be better to employ howitzers than guns, and with a howitzer the lowest possible charge should be used. In an offensive therefore, howitzers should be pushed up as far as possible.

(4) Inaccuracy of fire of batteries kept back.

These batteries are better able to fire accurately than those that have moved, but the lateral deviation of their fire increases proportionately to the range. The time comes when guns should be moved, although well within their range. While movement is taking place, a loss of fire power must ensue. How then can this loss of power be reduced to a minimum? Splitting up into small units each self-contained is a question of the organisation of artillery. Changes of position should be by *groupes* even if the *groupe* commander moves his batteries in sections. From this point

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of view alone it would appear advantageous for the *technical artillery unit* to contain the least number of guns possible—at any rate less than 12. The division of a six-gun battery into two sections of 3 guns each with all the necessary adjuncts for acting independently would seem suitable The movement of artillery being of such paramount importance it might be as well to examine the problems that arise in moving divisional artillery. Experience shows that the time taken in actually moving the guns is less than that required for the establishment of communications, observation, and for survey work. Suppose that part of the divisional artillery has to move forward 6 km. If a proper reconnaissance of the route has been made, and the country is not exceptionally difficult, this move will take less than an hour. On the other hand, the establishment of liaison and observation posts, as well as survey work, even if of the most meagre description, will take much longer. The effort to save time, therefore, must be made by improving the organisation of the reconnaissance groups and of the batteries. The vast changes brought about by modern conditions have changed the four-gun battery from a *technical unit* to merely a section. A battery nowadays except when acting as artillery of accompaniment, cannot prepare to open fire without the help of the *groupe*. The *groupe* has actually become the *technical unit*, whereas formerly it was the *tactical unit*. Nowadays the *groupe* commander, supposing his *groupe* alone is firing in direct support, has the overwhelming task of supervising the technical as well as the tactical conduct of fire. This is all the more difficult as he should be in three places at the same time :—

(1) With the infantry commander whom he supports.

(2) At an O.P. which may be miles distant from the infantry command post.

(3) Near his batteries to keep in touch with them, as well as with aeroplane observers and his own regimental commander. If two *groupes* are in direct support this becomes easier as the commander of the *groupement*[1] looks after the tactics and the *groupe* commander the technical side.

[1] Equivalent to our "group."

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Even so, improvised staffs are made use of to the detriment of the existing regimental and *groupe* staffs. Forming *groupements* is justifiable in trench warfare or in attacks on limited objectives; but such procedure militates against rapidity and decisive action. The defects in the present-day organisation of artillery are such that a complete re-organisation appears necessary. We propose as a basis :—

(1) To give artillery units sufficient staffs.
(2) To restore to the battery its character of technical unit.
(3) To make the *groupe*, thus relieved of the greater part of the technical problems, a truly tactical unit.
(4) To divide the artillery, so as to obtain most economically the greatest power of manœuvre.

The section of three guns.

When it first made its appearance the four-gun battery was suitable as wireless and aeroplanes were practically non-existent. The battery was self-contained for conduct of fire and supply. Now conditions differ from those of 1909. Amongst the changes brought about by evolution are the following :—

(1) The section commander's task is less important.
(2) The battery is more dependent on the *groupe*.

In pre-war days when the captain went on, the senior lieutenant commanded the battery until it came into action. Section commanders practically had nothing to do in bringing guns into action on their *chefs de pièce* (Nos. 1) which is the normal procedure. Section commanders no longer help the captain in getting guns onto the line. A *firing lieutenant* has been created who has become the captain's proxy, not only leading the battery before coming into action, but also directing fire in action. In short the officer section commander has disappeared, his duties not being beyond the capabilities of any intelligent No. 1.

Regarding the dependence of the battery on the *groupe*, this is manifested in many ways amongst which are : ranging with aeroplane or balloon observation, or combined observation, and in the survey work carried out either before or after coming into action. Battery officers could if necessary carry out the work independently of the "*officier orienteur*" of the groupe; but only in exceptional

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cases (as is pointed out rightly in Artillery Training) as survey work requires specialists. A battery is no longer what it was before the war. It has become a section of four guns. Now a section of four guns is difficult to command whereas a section of three is much easier, both when firing at targets of opportunity seen from the O.P., or for map series.[1] It seems logical then to adopt a three-gun section as the sub-unit in the battery. War experience has proved that it is easy to train educated men to command these sub-units in a few months.

The battery of two sections the technical unit.

The battery is a unit whose personnel and equipment are placed under a reliable officer, of experience ripened either by the exercise of military command, or by his functions in civil life. The commander of a battery organised on these lines will no longer have to undertake the centralised and difficult command of four quick-firing guns, but will supervise and control two subordinate officers. The actual command will be simplified and well within the capabilities of any reserve officer, who has kept up his knowledge by attending practical courses. As we shall see later it will also be possible to entrust to this officer the control of the observation and communication services of the battery. This will necessitate a third officer to command the *headquarter section*. His duties will be similar to those of the "*officier orienteur*" in the *groupe*. He will have under his orders a warrant officer in charge of communications and an observation party under a sergeant. The first-line transport of the battery, as well as the other services (quartermaster's stores, cooks, etc.) and the portion of the regimental train will be under another warrant officer and will form the fourth section of the battery.

Each section of guns will be commanded by a lieutenant, assisted by a sub-lieutenant or cadet (*aspirant*). Thus constituted the battery will possess all the means of carrying out reconnaissance, survey work, duties in action, and supply of ammunition and rations. Our proposal is that a battery should have two firing sections (of 3 guns) and have the following composition :—

[1] It will be urged that sections of two guns are simpler still—this is true, but economy of personnel demands that the largest number of guns possible must be placed under one commander.

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1 captain—B.C.
1 headquarter section (=B.C. party).
2 sections of guns.
1 supply and train section.

The headquarter section would comprise the personnel for reconnaissance, liaison and observation, for communication and wireless (1 W.O.), the machine gun and medical detachments. The communication detachment would form three telephone parties, and a receiving station (1 corporal, 3 radio operators). The personnel of such a battery would amount to :—

1 captain, 3 lieutenants, 2 sub-lieutenants or cadets (*aspirants*).
2 warrant officers, 2 artificers (chief).
240 other ranks.

The groupe.

By relieving the *groupe* commander in this way of the greater part of his technical duties, he will be able to devote his attention to his normal task which is the direction of fire. Of course the technical side cannot be divorced wholly from the tactical, so he must control his batteries and assist them in their tasks. To enable him to do so his staff should include an officer in charge of *intelligence* and *survey*; also an observation party for ranging by air bursts, a procedure likely to develop greatly. But his chief task will be directing fire, and his place will be not with the batteries, where he will only have a communication centre, but further forward; either with the infantry colonel if the *groupe* is in direct support of an infantry regiment, or in the zone of observation posts if in combined action. In the former case, he with an officer of his staff will be responsible for a liaison party, the personnel being drawn from the batteries. He will also have a wireless sending set to communicate with the batteries. Finally he will send a staff officer to supervise the supply of ammunition to the three batteries—for normally up to the 155 inclusive, *groupes* will consist of three batteries. The staff might consist of :—

1 captain—adjutant and in charge of communications.
2 lieutenants for liaison and observation.
1 ,, or sub-lieutenant for the *échelons*.
Telephone, wireless (sending), and power-buzzer parties.

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1 observation party for observing high bursts.
1 senior N.C.O. in charge of personnel, orderlies, cooks, etc., in all amounting to about 50 of all ranks.

The regiment.

A regiment normally consists of two *groupes*, i.e. 36 guns. It would be difficult for one man to command a greater number without having resort to *groupements*. The whole point of the proposed organisation is to do away with *groupements*. Each regiment should have the staff and supplementary establishment[1] laid down in the present regulations. The latter should have a survey detachment. Theodolite survey is easily carried out, the instruments are simple, and can be easily managed by any intelligent gunner. It is most important that the divisional artillery as well as the heavy, more especially when armed with howitzers should have its means of survey close to hand. Sound ranging would be carried out by the Corps or Army Section or heavy artillery staffs.

CHAPTER V.—ARTILLERY OF HIGHER UNITS.

§ 1. DIVISIONAL ARTILLERY.

The deductions arrived at in the preceding chapters would point to allotting to divisions:—

(1) Artillery for defence against low-flying aeroplanes.
(2) Artillery of accompaniment.
(3) Artillery of support.

(1) This might be formed[2] of automatic guns of small calibre (say 37$^{m}/_{m}$). Two groupes of four guns (each of two sections) would suffice for battery positions and *échelons*.

(2) *Artillery of accompaniment.*

Everyone agrees nowadays that this is necessary. At present we use sections of 75 taken from the divisional artillery. This is merely an improvisation. In our opinion the weapon should have the following attributes:—

[1] Each French Infantry Regiment has a "*Compagnie hors rang*" and Artillery Regiment a "*batterie hors rang*," they consist of specialists, etc.

[2] In addition to the machine guns belonging to the batteries.

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(a) High angle fire.
(b) Mechanical traction; high tactical mobility.
(c) Maximum range: 3 km.

The weapon should be a howitzer, not only to be able to reach an enemy behind cover, but also to obtain cover for itself if even in a shell hole. The 37$^{m/m}$ gun has not been welcomed owing to its flat trajectory. For the same reason the weapon must not present too big a target. On account of gas warfare mechanical transport should be adopted. It seems sound to limit the range to make it keep to its task of accompaniment. It will rarely fire over open sights, but its fire will be directed by voice from the O.P. High angle fire will allow of concealment though close up to the O.P. The maximum range of the target from the front line is unlikely to exceed 1000 m., which necessitates a maximum range of 2000 m., fire being directed from near the battalion commander—for reasons concerned with liaison already touched on. To fire accurately at 2000 m., a maximum range of 3000 m. must be allowed.

A few words on the calibre. As small calibres have good effect on personnel one might be tempted to adopt a calibre of 75 or even 65$^{m/m}$. A small calibre, too, is easier to ammunition. But moral effect must be considered, and it is undeniable that the moral effect of a trench mortar bomb is much greater than that of a Stokes or of the 65 gun. At a range of 2000 m., a very powerful charge of H.E. in a thin envelope, can be fired by using a low charge. The 150 T in present use is a little on the heavy side. A weapon with a calibre of something less than 120 firing a shell containing 3 kg. of H.E. might do. 3 kg. is nearly equal to the charge in the 145 steel shell. The question is worth further discussion but details as to the actual specification are rather beyond the scope of this article. In any case it would be most advantageous to be able to use these weapons as trench artillery. They would prove most useful in position warfare . . . . in assisting the artillery in destructive bombardments, and for wire cutting. Now if this artillery is to fulfil the double task of accompaniment and trench mortar work it will not do to cut the establishment down too much. In the infantry division of three regiments it does not seem too much to ask for six sections of two guns. We propose:—

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1 *groupe* of three batteries, each battery consisting of two two-gun sections.

(3) *Artillery of support.*

Our final suggestion for the divisional artillery of support is that the weapon should be a light howitzer of a calibre about 95$^{m}/_{m}$, and the 155C should be relegated to the corps, and general reserve of artillery: The characteristics of this howitzer would be:—

(1) Its weight should be about the same as the present 75 gun.
(2) Elevation up to 43°, and traverse at least 40°.
(3) Charge separate from shell.
    3 charges (with anti-flash arrangement).
    2 shell (besides special shell), one capable of taking a very high charge of H.E., the other for man-killing, either a shrapnel with heavy bullets, or a segment shell.
(4) Traction, so that either horses or mechanical traction can be used.

We have seen that 72 of these weapons divided into 12 batteries in *groupes* of three would be sufficient to support an attack on a 3000 m. front. We have taken it in arriving at this number of 72 howitzers that an attack was being made along the whole front. The objection might be made that part of the divisional front might remain passive; but artillery would be needed to prevent enemy personnel being moved from this passive front. Again it does not do to reduce the front of attack too much or there is the risk of the attack being crushed by concentrations of fire from the flanks. Thus we would have four *groupes* of three batteries of six light howitzers in a division of three infantry regiments. It would be necessary to form two regiments of these four *groupes;* this would be better than having one big regiment of four *groupes*, for:—

(1) A regiment of 36 guns is, generally speaking, handier; this is particularly important for artillery supporting the infantry.
(2) The constitution of two regiments produces a supplementary staff. In a battle it would be possible for the C.R.A. to function the artillery of direct support, and the artillery

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of combined action with the existing staffs. In the case of the approach march in two columns, the artillery with each would be under its own commander.

(3) If mechanical traction is given to divisional artillery one regiment might be horse-drawn and one regiment *porté*, so that :

(4) If the division were moved by motor transport, the artillery accompanying it would have its own commander and be part and parcel of the division.

Without having worked for it in any way this brings us very nearly to the composition of the German divisional artillery of 1914. The latter comprised, as everyone knows, two regiments of two *groupes* of three six-gun batteries, one *groupe* of one of the two regiments being armed with 105 howitzers.[1] We make this remark advisedly; not to justify our scheme, but to prove that by increasing our number of divisional guns we are not exceeding the number that was thought necessary by an army trained and equipped for *a war of quick decision*. Organised on these lines, the only reinforcement the divisional artillery would require is ammunition; the effect of surprise would be easier to attain. In defence of a wide front there would be still enough artillery to support the infantry, always providing that sufficient ammunition was available near the batteries.

In position warfare, it would be possible to rest the artillery with the infantry. This would be of great advantage, not only to the equipment, but to the personnel. Batteries would no longer (as in 1917 and 1918) be kept indefinitely in the line until they had lost all capability for manœuvre. A divisional artillery park would be necessary. The D.A. would comprise :—

(1) Staff.

(2) A brigade of two regiments of light howitzers (of two *groupes* of three batteries).

(3) One *groupe* of three batteries (each of two sections of two guns) of immediate accompaniment.

[1] There is, however, this great difference; all the guns in the proposed organisation are howitzers, and the six-gun battery has two sections of three guns instead of three sections of two, and the proposed batteries have all the technical appliances evolved by the progress realised since 1914.

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(4) One *groupe* of two batteries (each of two sections of two small-bore automatic guns) to deal with low-flying aircraft.

(5) A divisional artillery park.

The question of the ranks that the commanders should hold is relatively unimportant, and will not be too much insisted on.

Working upwards, the battery of two sections should be commanded by a captain. The command of this unit is a very responsible one, comprising as it does three lieutenants, three sub-lieutenants or cadets, 250 other ranks and considerable and valuable material. Although more difficult than the command of a company or squadron, it should not be beyond the capabilities of an experienced officer. The *groupes* should be commanded by majors.

The regiment of two *groupes* would be under a lieut-colonel, and it would be as well to attach a major to his staff to replace him if he became a casualty. Similarly we propose that the *groupe* commander's adjutant should be a senior captain (as is the case in an infantry battalion).

The brigade of support should be commanded by a colonel.

The divisional artillery, a considerable command, both in personnel and material, should be under a brigadier-general. The C.R.A. should be with the divisional commander.

Either the colonel or a lieut.-colonel should be with the general commanding the fighting line (usually the divisional infantry commander[1]) in accordance with the divisional commander's artillery dispositions.

§ 2.—Corps artillery.

The corps artillery which had previously to the war consisted entirely of 75's, had been given heavy artillery mainly for counter-battery work—its principal task. It would appear logical to give it the task of destruction also. If destruction requires a calibre of at least 155, this is not the case with counter-battery. Destructive counter-battery shoots are more effective if one uses heavy guns, but we know that destruction of hostile artillery is rarely possible.

The long range of the target brings with it such wide lateral error as to prevent the accuracy necessary for material destruction.

[1] In the French Division a brigadier-general commands the three infantry regiments—each regiment being of three battalions, i.e., equivalent to an English brigade.

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The hostile artillery will try to avoid the attentions of our survey and intelligence sections by judicious use of ground, and by movement. So for counter-battery one must use a gun suitable for the task of neutralisation. On account of the range it must be of high calibre. At present the task is carried out by the 105 gun with which the corps artillery is armed. This gun has served its purpose but everything was sacrificed to mobility in its design and its range is nowadays considered inadequate. It has no great advantage over the present 75 which ranges up to 11 km. with a special shell,[1] its own range being only about 12 km. Its great mobility might be useful for mountain warfare, or in countries where there are no roads. For the theatre in which a war with Germany might commence it would be as well to replace it by a gun of the same calibre with wide traverse, and ranging up to 15 km. As it weighs less than 3500 kg. ($3\frac{1}{2}$ tons) it could be either horse-drawn, or tractor-borne (*porté*). The present pattern gun should be retained provisionally. In most of the corps artilleries the 155L[2] of 1917, a very powerful gun, has been replaced by a new model (1918) of the same calibre and which is really a "gun-howitzer." Its range is only 2 km. more than the 155C.S.[3] but it is much more handy and most of the effective enemy batteries will be within its reach.

It seems logical to organise the corps artillery on the assumption that two divisions will be in the line, and that it may be called on to co-operate with divisional artilleries for destructive shoots. This would be met by having one regiment of howitzers, divided into two *groupes*, (of two battalions each). This would provide sufficient staff to function howitzers sent up as reinforcements from the general reserve of artillery. The other regiment would contain all the guns of the corps artillery. The question of horse or mechanical traction must depend on conditions at the time of mobilisation.

Suggested composition :—

(1) A staff.

(2) One regiment (of two *groupes* of two batteries) 155C.S.

[1] *Obus A.L.*

[2] *155 canon long.*

[3] *155 canon court Schneider* (howitzer).

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(3) One mixed regiment. One *groupe* of four batteries 105, and one *groupe* of four batteries 155L 18.
(4) One *groupe* of three batteries 37m/m automatic.
(5) One corps artillery park.

§ 3.

We have few remarks to offer regarding the remainder of the artillery, not allotted to corps and divisions. As there is not a great deal of it, it is less costly, and on that account should be modernised to the greatest extent possible and unsatisfactory guns resolutely got rid of.

We have seen the advantages to be gained by putting all the light tractor-borne artillery into the divisional artilleries, allowing as it does the high command to send off a division in lorries accompanied by part of its own artillery.

Army artillery might include in its medium guns the 105 gun and the 155 howitzer. For destruction of fortifications the 240 seems more suitable than the 220. Perhaps the former might with advantage replace both the 220 and 280. The 155 G.P.F.[1] has the great advantage of a very wide traverse owing to its split trail. It has the two-fold disadvantage of a very wide track, and great weight. Its track precludes the use of bridges up to its weight. Its weight (13 tons) ties it to roads and renders it very immobile. The same applies to the 155 Mle. 1916, which has not the advantage of quick switching. We would prefer to see a gun of the same calibre weighing seven or eight tons and ranging up to 20 km.

[The author here concludes his theories but proposes to work out in a future number a tactical scheme to show how this system of artillery would work.]

[1] *155m/m Canon à Grande Puissance—Filloux.*

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THE 'IRAQ LEVIES.

By Lieut. K. F. McK. Lewis, M.C., R.A.

THE reason that this article was written must serve as its apology.

On returning to England, the writer found that many junior officers of the Regiment know very little of the various small forces that our Colonial Office maintains in different parts of the world, yet many are keen to get on some "side-show" with a chance of seeing active service in interesting countries which they might never reach if they continued serving with the Regiment. It is not within the scope of this article to discuss the pro's and con's of secondment from the Regiment, but should officers decide that it is a good thing, they should obtain full information on and weigh up the advantages and disadvantages of the different forces for which they can apply, from the points of view of soldiering, sport, finance, climate, etc. With this in mind, the writer conscientiously refrains from rhapsodizing over a country, a people, and experiences which interested him deeply, and gives but bare facts as an unbiassed guide to those who contemplate secondment.

The 'Iraq Levies.

This force at first came into being as 'Iraq Levies in 1919, though many of the men and native officers had seen service prior to that date in some of the irregulars which were raised so hurriedly for police work after the armistice. Levies are Imperial troops under the aegis of the Colonial Office (Middle East Dept.) and are part of the force which Great Britain is maintaining in 'Iraq until such time as that country can, under the conditions of the mandate, undertake its own defence—to which end the 'Iraq army is now being trained.

Levies consist of Headquarters, two cavalry regiments, one pack battery, four infantry battalions and a machine gun company, plus certain auxiliary units. Headquarters are in Mosul, where there are also the Levy depôt—for recruiting, training, courses, etc.—the transport company, field ambulance, remount depôt, etc.

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Since the Levies are essentially a frontier force, all units are not in permanent stations, and while semi-permanent stations are occupied by some units for a year or so at a time, others are on the move or under canvas during the spring and summer months.

Recruits. The cavalry regiments and the transport company recruit Arabs and Kurds (Mahommedans) who are used to the saddle from infancy. They make smart, efficient soldiers, whose cleanliness of turn-out, both horse and man, bids fair to rival that of any British unit.

The pack battery and the machine gun company recruit Assyrians (Christians). Bred from an ancient fighting stock of mountaineers, these men are pre-eminently suited for pack artillery work on the rugged and precipitous frontiers of 'Iraq. They are very keen soldiers, comparatively quite intelligent, take a great pride in their unit, their turn-out, drill and cleanliness, and are very loyal. Of the four infantry battalions, the 1st (the oldest unit in Levies) recruits a well-built, smart type of Arab; much taller than the average. They are of the tribes who live in the so-called "marsh" country between Basra and Baghdad. This battalion is stationed in Baghdad and is the only Levy unit south of the Mosul vilayet. The 2nd, 3rd, and 4th battalions recruit Assyrians, of whom be it further said that as infantry soldiers their equal in mountain warfare is hard to find—in any army.

Terms of service. Officers are seconded for a period of two years. During the second year they may apply to extend their tour of duty for a period of one or two years. Leave is earned at the rate of one day for every four days' service in the country, and includes voyage leave outside the frontiers of 'Iraq. Leave must be taken after two years in the country, and can only be cumulative for a three years' tour, e.g. 3 years' tour = $29\frac{1}{4}$ months in 'Iraq and $6\frac{3}{4}$ months' leave and voyage leave. Officers join and go on leave by the Overland Mail Route (passage paid) which takes about two weeks from London to Baghdad.

Pay. As it is understood that certain slight revisions in the rates of pay may take place, no definite figures can be given, but the nearest possible is £600 p.a. for an unmarried subaltern of seven years' service. This includes all allowances, some of which (such as language allowance) have to be qualified for. It should be

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remembered that as these emoluments are paid from Imperial funds they are subject to the usual taxation. Financially the unmarried subaltern will find himself well off. He will be able to keep ponies, go in for most forms of sport, and, in addition, save a pretty considerable sum during his term of secondment.

Active service. Now that 'Iraq as a whole is in a settled condition, there is little chance of operations on as big a scale as formerly. Along the northern and north-eastern frontiers, however, certain areas are still a little turbulent, and in those tracts of country frequented by certain notorious outlaws and nomadic tribes there are occasional outbreaks of lawlessness and demonstrations against Government. To deal with such situations as arise in these areas, small columns of infantry and cavalry are despatched; accompanied, should the situation so demand, by machine guns and a section of the pack battery. As the majority of the tribesmen against whom these columns are sent are mounted on hardy hill ponies, they are very mobile but are usually content with harassing the protective troops, and fade away when any attempt is made to pin them to their ground. Occasionally an all-day engagement develops and, owing to the nature of the country, this is usually fought on mountain warfare lines.

Country and climate. The British mandatory sphere in 'Iraq covers an area of approximately 150,000 sq. miles and is still divided into the three old Turkish vilayets (districts) of Basra, Baghdad, Mosul. The two former are in flat country and only the comparatively small tracts that are watered by the Tigris and Euphrates are cultivated. The rest is arid desert. The latter, rising gradually from its southern boundary, breaks into rolling fertile plains which are at present the richest cultivated lands in the whole of 'Iraq. From these rise the foothills, and finally, beyond many a wooded slope reminiscent of home, the craggy mountains of the northern and north-eastern frontiers, topped by the snow-capped peaks of Hakkiari. Though the climate of Iraq is more constant in its phases than our notoriously fickle English weather, its extremes of temperature are much greater than we experience at home; yet it is an essentially healthy climate, and the weather in most of the Levy out-stations is as good as anyone with a northern European up-

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bringing could expect. In the hot weather (May—October, inclusive) such places as Basra, Baghdad, and even Mosul record shade temperatures of 120° and more, but this is compensated for by good quarters and electricity—with all its attendant comforts. The up-country stations, though they have none of the comforts of civilisation, do not get such high temperatures, and the nights are always cooler than the days. In the cold weather (December—February, inclusive) all the rigours of northern Scotland may be experienced in the out-stations, while the plains become a morass of that world-famous, glutinous "Mespot mud." March and April, however, compensate for winter past and hot weather to come. for in these two months the whole country blossoms forth into the most brilliant colours—the very rocks grow incredibly green grass and wild flowers—and the temperature, both day and night, is ideal. Of disease, tropical or otherwise, there is very little, and the only thing to remember is the secret of keeping fit—exercise and moderation.

Kit. From the foregoing description of the climate it will be seen that two complete outfits of both uniform and mufti are needed—one tropical and one for an English winter. A full camp kit is much more of a necessity than a luxury.

SPORT.

As compared with what one hears of India, excellent sport can be had at a small cost—certainly one's amusements will cost much less than they do in home stations.

Polo. Ponies can be bought from £20 upwards. Arabs are the most common and are most generally used. The stamina, speed and handiness of this breed is too well known to need further comment. The Kurdish hill ponies, though Arab by descent, are chunkier than the Arab proper and though very handy, are too slow for the better class games. The natives love to race their ponies and ride them on a cruelly hard bit, but with careful bitting and bridling they quieten down, and it is fairly safe to say that anyone who has the necessary patience and an idea of schooling can buy a pony raw to the game at the beginning of a season and play him all the next in the best class polo the country has to offer. Polo is played regularly at Basra, Baghdad, Mosul, Kirkuk, Erbil,

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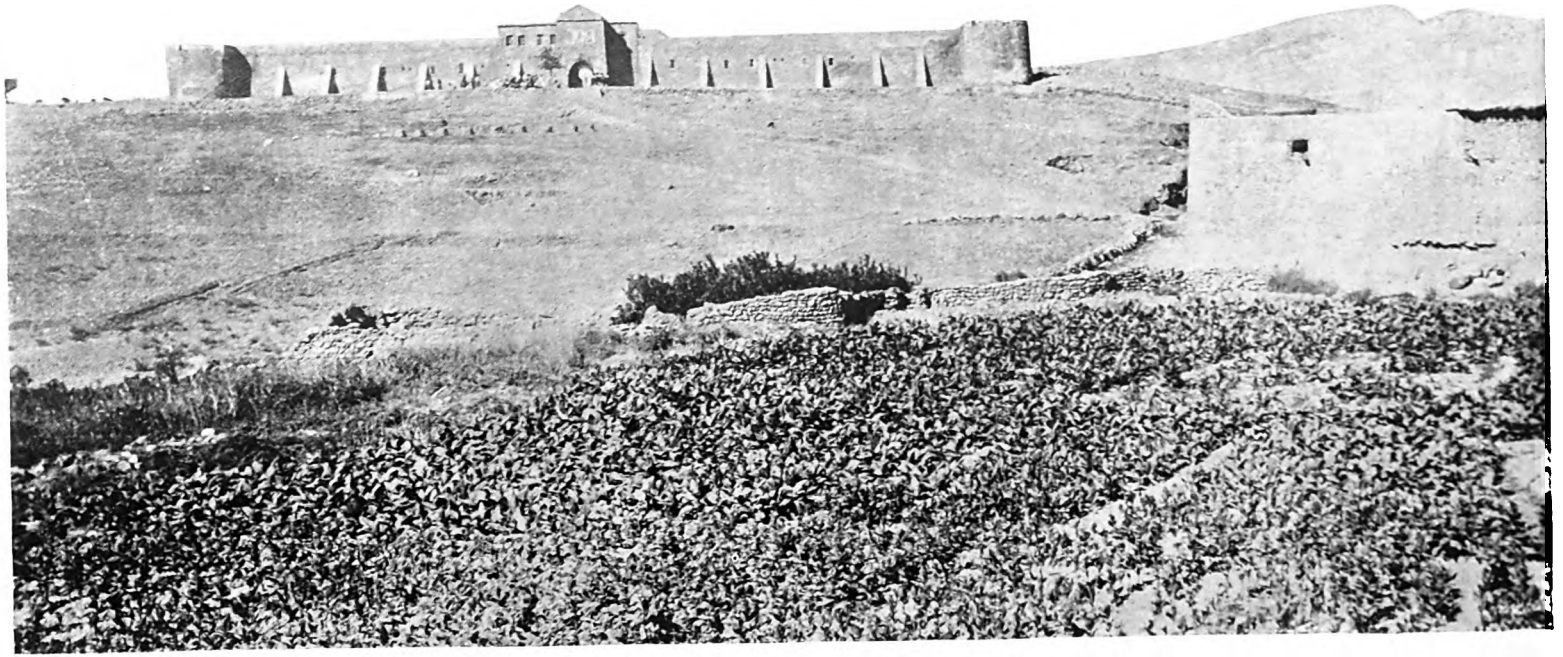

THE FORT, KOI-SANJAK, SOUTHERN KURDISTAN. A "ONE COMPANY" LEVY OUT-STATION.

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and at a lot of up-country stations as and when opportunity offers and a sufficient number of players are available.

Several race meetings are held during the course of the year at Basra and Baghdad.

Hunting. There are two packs in 'Iraq. The "Exodus" hunt the Baghdad district with about eight couple of good foxhounds, while "The Half-Anna Hunt" find their sport in the Kirkuk district with salugis. Other stations keep their bobbery packs, and a run with these is not to be despised for jack are plentiful, and though mud walls and irrigation ditches are the only jumps to be found, some of the latter have proved to be quite broad and deep enough for some folk. The writer has many pleasant recollections of a certain bobbery pack, in particular of the day hounds got on to a big wolf.

Pig-sticking. In the Baghdad vilayet sport is only occasionally found, owing to the nature of the country, the 'Iraqi pig (who is very retiring) and the difficulty of getting beaters. Road and rail communications are very bad to the best country, and so this has become one of the rarer sports of the country.

Shooting. Greater and lesser bustard, geese, and duck of every known kind, black partridge, chikor, woodcock, snipe, si-si, and sand-grouse are found in practically all parts of the country. In the Baghdad vilayet—north of the town itself—is to be found some of the finest goose and duck shooting in the world. Black partridge, chikor, woodcock and snipe are to be found in greater numbers in the northern and north-eastern parts of the Mosul vilayet, and sand-grouse—found all over the country—are so numerous and destructive to crops that in certain areas they are treated as vermin.

There is no big game in 'Iraq, but in the mountains of the Mosul frontier are small brown bear, snow leopards, ibex and mountain-goat. As it is not wise to go many days into the mountain country without an adequate escort, shooting has to be carefully planned in conjunction with route-marches and other "training" from the most favourably placed station. Most stations have their tennis courts, and a few have golf courses which of necessity are pretty rough, but quite playable.

There are more gunners in the Levies than are required to fill the establishment of the pack battery, and thus many are com-

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manding squadrons and companies in the cavalry and infantry units. Application for posting to the battery should be made to Levy Headquarters on joining, and applicants await their turn in other units. The writer spent the whole of his tour in Levies commanding a company—a very interesting and instructive task and one which brought home to him the infantry officer's difficulties and points of view on many subjects.

In conclusion: 'Iraq gained an unenviable reputation during the war which it has not yet shaken off, and many people still believe that section of the daily press which waxes hysterical over the "vast desert" which, it avers, surrounds the town of Mosul. It can be stated without hesitation that the country as a whole is healthier than most of Central Asia, and that those places in the Mosul vilayet where most of the Levies are stationed are as healthy and fertile as any country one could wish to serve in. The 'Iraq Levies are, in every sense of the expression, a "live show" and though they are continuously employed in keeping the peace on the frontiers, they are as continuously kept in close touch with the most modern methods of training in all arms. Any officer seconded to this force has a unique chance of seeing active service in a most interesting country with fine native troops whose keenness and efficiency are of a very high order and amongst whom are to be found some of the best fighting material in the world.

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THE NORTH RUSSIAN CAMPAIGN.

A Lecture delivered at the Royal Artillery Institution, Tuesday, February 16th, 1926.

BY MAJOR-GENERAL SIR EDMUND IRONSIDE, K.C.B., C.M.G., D.S.O.

General Sir George Milne, G.C.M.G., K.C.B., D.S.O., Colonel Commandant R.A., in the Chair.

GENERAL SIR GEORGE MILNE: Gentlemen, I do not think that I need introduce General Ironside to you. I will ask him to go straight on with his lecture.

MAJOR-GENERAL SIR EDMUND IRONSIDE: Gentlemen, I am going to talk to you to-night about the North Russian Expedition. I have already written in the R.A. Journal about the winter difficulties which we experienced and I will now try to avoid repetition. Politically the campaign was, in its later stages, much in disfavour and little has been written about it. Still, in many ways, there are more valuable lessons to be gained from it for the British Army of the future than from the main operations in France. That is my excuse for speaking to-night.

The origin of the Expedition was quite definite. About the middle of 1918 there were no signs that the Central Powers would be beaten that year. One of the great combatants, Russia, had collapsed, and the Entente had been hard put to it to meet the reinforcements which Germany was thus enabled to withdraw from her Eastern front. There were many signs that Germany intended to try to exploit Russia economically and thus secure the material with which to continue the struggle. There was also an immediate danger that submarine bases might be established at the North Russian ports, Murmansk and Archangel. The man-power of the Entente was reaching exhaustion and in their search for immediate supplies, the military authorities turned their eyes towards Russia once more. With the signature of peace between Germany and

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the Soviet some hundreds of thousands of prisoners of war had been liberated, and these men were trying to work their way home from the distant prison-camps where they had been confined. Amongst these prisoners were some 50,000 Czecho-Slovaks, devoted to the cause of the Entente and who had been formed into a corps with the help of French officers. There existed a plan for passing these men by way of Vladivostok to France, but it was soon realised that if they were to have any effect upon the situation in 1918 some speedier means of bringing them to the scene of action must be adopted. For all these considerations, therefore, it was decided to send a small force to North Russia. We may summarize the objectives of the campaign as follows:—

Main Objective.

To prevent the exploitation of Russia by Germany, should the war continue through 1918 and longer.

Minor Objectives.

1. To reconstitute the Eastern front, making use of all man-power which could not be employed otherwise and preventing further transference of German troops to the West.
2. To prevent the establishment of German submarine bases in North Russia.
3. To secure the stores, the property of the Entente, lying on the quays of Archangel and Murmansk and to prevent their transference to Germany.

The despatch of the Expedition to North Russia was ordered by the Supreme War Council, Great Britain being entrusted with the command and administration of all troops taking part. The campaign was thus truly international, nine different nationalities taking part in the operations.

A detachment of British marines occupied Murmansk in June, 1918, and in August a force of British, French and United States troops seized Archangel. As regards the Czechs, these had commenced their westward movement and were approaching the Siberian frontier. The Soviet Government, however, which did not relish their transference to Archangel and the turning of Soviet territory into a theatre of war, were putting such difficulties in the

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way of their movement that there seemed little chance of their arrival at Archangel before the fall of winter in 1918. A few Russians, chiefly of the officer class, did rally to the Entente forces, but their numbers were insignificant. Volunteering for fighting is unknown in most countries and it was found impossible to raise any enthusiasm among the Russian peasants for a return to any anti-Bolshevik régime. Although the Entente effort thus failed to restore the Eastern front, still we have definite evidence from German sources that the threat of restoration did prevent any transference of German troops to the West at a very critical period in their fortunes. It may well be asked then, why, when they had already achieved their object, they were not withdrawn before winter. Archangel is frozen up about the end of October and a decision to withdraw would have had to have been made in September. At this time there was no certainty that the Central Powers were about to collapse and at the time of the Armistice in the West the Archangel force had already been frozen up for some weeks.

During the ensuing winter the objective of the Expedition became most confused. It had been firstly a purely military effort directed against the Germans, and the Allies now found themselves actively engaged with the Soviet Government. We had espoused the cause of all elements opposed to the Soviet and we could not abandon them to their fate, after having used them for our own purposes. Military operations were always difficult during this period owing to the lack of a clear political objective.

All three services were strongly represented in North Russia and for the operations all were placed under the command of the Army Commander. As is not surprising with such a heterogeneous mass of nationalities, troops and services many mistakes were made. I think that perhaps the worst mistake that was committed was in connection with the Dwina River flotilla, and the fault lay entirely with the Army. The Expedition had pushed forward some 150 miles up the Dwina and Vologda railway and columns were in process of settling down into positions suitable for the winter. No one quite knew when the first frost would actually come and the Army fixed the 1st October as the date for the flotilla to descend the river, either to winter in Archangel or to return to England.

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No sooner had the flotilla gone than the Bolshevik gunboats came down and bombarded our positions from long range, destroying the carefully prepared winter accommodation and causing several hundreds of casualties. Had there been one or two long range guns taken from the ships and mounted on shore we should have been saved from what looked at one time like a serious collapse, for the land service had nothing that could range further than an 18 pr. A serious error of judgment on the part of the Army. In actual fact the icing up did not come for nearly a month later than was expected and the Bolsheviks had ample time for their bombardments, to which we could not reply. In such temperatures as you get in North Russia fighting depends largely on accommodation. Men cannot remain for long out in the open. If you get your accommodation destroyed you must move off to find more. Even the smashing of window panes may be a serious matter.

There were, as I said, nine different nationalities in North Russia, British, French, American, Russian, Italian, Serbian, Polish, Czech and Chinese. The columns of the Archangel force were widely separated, and at first it was thought that columns ought to be national, that is to say of one nation only, under their own commander. At all times the administration had to remain British because we were the only people who had the necessary personnel. It was soon found that in these circumstances each nationality thought that its own hardships were greater than those of any other. Out of sight out of mind, and the columns never saw each other. With mixed columns none could say that the others were loafing. Liaison troubles were of course endless, and there were few Russian speakers in any contingent except the American. Russian rifles and equipment were used by all by way of simplification but the supply of rations was complicated. Each nationality demanded some tit-bit and raised loud complaints when they did not get it. Any excuse was good enough to whip the hard-worked British administration. Winter conditions I have described and perhaps one example here will suffice. We had one fight in 85 degrees of frost—the worst day we had—and I was able to watch the fight from a look-out post. The enemy came across in white smocks, very difficult to pick up against the snow. Their attack failed and they left a few figures on the ground in front of our blockhouses.

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I must have been on the ground within a half-hour of their being wounded and yet all were dead from exposure. There was indeed one great advantage in this winter fighting. Wounds were clean, and provided a man could be got quickly under cover and provided with stimulant, he had a good chance of recovery. As regards stimulant, one of the contingents was "dry." I only wish that some of the people who ordained this had had to go through what the men did in North Russia and without stimulant. Of course the "dry" contingent managed to get their whack of either rum or "pinard," the French red wine.

The winter kit had been designed by Shackleton, the Arctic explorer, and very good it was too. *A propos* of this I remember one amusing incident. Shackleton had come across from Murmansk to talk to the men on the subject of winter conditions. Outside the hut in which he was to lecture he found a man standing who was not wearing his "Shackleton" boots. These boots had been made for skiing and had absolutely smooth soles. To adapt them for general purposes a kind of football bar had to be put on the sole. Without these it was quite impossible to walk on frozen snow. On Shackleton enquiring why the man hadn't his boots, he received the reply, "Lor Lumme Guvnor I must give my backside a chance." I think the production of some 50,000 winter kits was a feat of which the British War Office might well be proud.

As is always the case in small wars, mobility was the key to success. In North Russia neither side was mobile. Had there been even a body of 500 expert skiers such as one meets in Norway, the side which possessed them would have done what it liked with the other. Though to teach men to use snow-shoes was simpler than teaching skiing, and though ample kit and sufficient instructors were available very little could be done in the time.

Besides the fighting which took place continuously on one or other of the fronts the chief business of the British command lay in the organisation and training of the local Russian forces. These forces were raised to 20,000 before we left. Such fine material. Well-clothed, well-fed and seemingly content. The lot of the Russian officer was hard. Many had been through the Revolution in all its stages and had been shot at by their own men. Others had done years of imprisonment in Germany and Austria. Is it sur-

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prising that many of them had deteriorated? They did not understand our methods of intensive work and training. They considered that we were amateurs, whereas we were experts in raising armies from nothing. Our officers were impatient of the dilatory Slav mind which is so easily raised or depressed. As an example of Russian methods of maintaining order I will quote you three orders which were issued by senior commanders. I am afraid that they would create nothing but merriment were they to be issued to our officers and men. Here they are.

"Yesterday, the 10th December, at 10 p.m. I was walking near the Lomonosoff school. From the direction of the Cathedral I heard a disgusting flow of gutter language. Going further I met two sailors, and approaching one of them called his attention to the absolute impermissibility of such filthy language in the street. The other sailor went on, but the one to whom I addressed myself slovenly declared that he was intoxicated and with an impudent gesture blew his nose on the pavement. Wishing to have a closer view of this representative of our military forces in course of recreation, I directed him to a lightened window. Here I convinced myself that he was without his striped vest and that he had a naked neck. Telling him he was improperly dressed I ordered him to follow me to the first military post to which I would hand him over. The sailor quickened his pace, rejoined his companion and both made off. With the help of the guard of the British Commander-in-Chief I detained both. The second sailor began to justify himself and I asked him whether he was wearing his striped vest. Upon opening his jacket I saw a striped vest with a woman's locket clasping it at the top. I ask myself the question. When will these people realise that they are disgracing the honourable uniform of a defender of his native land by carrying on themselves women's ornaments? The names of the sailors are so and so and so and so. I request that Rear-Admiral X. will investigate all this and act according to the law. How pitiful is all this and how deeply disgusting!"

"Madame Botchkareva arrived from Shenkursk and reported to me on December 26th. She wore officer's uniform of a Caucasian pattern with shoulder straps and was accompanied by Lieut. Filipoff whom she called her Adjutant. Madame Botchkareva offered me

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her services for the organisation of the Russian army. I do not undertake to estimate the merits of Madame Botchkareva in the organising of the Russian army and I consider that her work for her country and the shedding of her blood will be finally appreciated by the Central Government and Russian history. I only consider it my duty to declare that within the limits of the Northern region, thank God, the time has already come for quiet creative Government work, and I think that the summoning of women for military duties, which are not appropriate to their sex, would be a heavy reproach and a disgraceful stain on the whole population of the Northern Region. I order therefore that Madame Botchkareva shall take off her uniform and breeches and that Lieut. Filipoff shall report to the Town Commandant."

"Talking to-day to Captain A., I was told that Lieut. Y. had said that Yemetskoe and Seletskoe had been captured by the Bolsheviks. On being asked by Captain A. where he had heard it, Y. said that I was supposed to have said it to some young lady. I am not acquainted with any young ladies in Pinega and have not been sent here to flirt but to fight, I demand from officers and privates, who during their free time flirt with women not to discuss with them military matters, but to entertain their ladies with subjects more interesting for them, such as love, the moon, etc. It is scandalous to spread silly panic rumours."

It can be imagined how difficult it was to hurry such commanders.

In the late war propaganda became a legitimate weapon of war. The Bolsheviks made full use of this weapon. Every tree outside our lines was plastered with pamphlets in every language. I think I can honestly say that this campaign had little or no effect upon the British soldier. He treated the propaganda with the kindly contempt which he adopts to all foreigners. And one can say that our men showed up well amidst all the contingents. They fought well and cheerfully. I believe myself that tradition is greatly responsible for this. The Britisher has always fought outside his own country. The British Empire has made this so. Other nationalities may shine in defence of their own homes but not abroad. I myself came in for a goodly portion of vilification, and one of the pamphlets showered upon me ran as follows :—

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"A 'White Guard' proclamation, signed by General Ironside, Commander-in-Chief, has reached us. This proclamation was addressed to one of our Regiments stationed on the Northern Dwina.

All soldiers of the Red Army must pay attention to what it says.

To give Mr. Ironside his due it must be admitted that there is a certain amount of truth among his infamous lies. He boasts 'Our victorious (ahem . . .) troops are hurrying north and bring with them terrible engines of destruction which you have never yet seen.' He adds 'this is not the first time that we have made a descent upon another country. We are past masters in the art.'

Perfectly true, General, you English together with your Allies wish, by the use of guns, ships and other engines of war never yet heard of, to devastate our fatherland. Very true. But why wag your tail about it? Why end your proclamation with lies?

Because, General, you foresee what reply you will get from the sons of our socialistic Fatherland in answer to your impudent proclamation. You know that hundreds of thousands of Russians will cry as with one voice. No! This shall never be! We will never surrender our Fatherland, striving for better things, to be plundered and destroyed by British robbers.

General, you know this well, and for this reason you end your address with lies 'behind the Commissars stands Germany, guiding the affairs of Russia and through your blood trying to save her own skin.' Who will believe this? For, at Versailles at this very moment those butchers the Allies are themselves skinning the Germans (by the Versailles Peace). In view of this it would not be a bad thing if you were more discriminating in your fictions. True, much discrimination cannot be expected of General Ironside—this bandit was brought up in another school. In the past this "General-feldwebel" was renowned for his rough and bullying treatment of the soldiers under him and for his servile attitude to his superiors. The mere sight of this great hulking red-haired overgrown boy makes one want to spit in his face . . . .

Into the sea with the red-headed feldwebel Ironside!

Long live the steadfast and mighty Red Army!"

One of my own personal difficulties was my dealings with the many distinguished Ambassadors and Ministers who were shut up

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with us in Archangel. The Commander-in-Chief was a kind of neutral in respect of his dealings with them. There were difficulties of housing, heights of flag-posts and privileges of buying at our canteen. In similar circumstances I can only recommend all soldiers to deal entirely through the British Minister, if they can find a sympathetic one as I did. A diplomat can arrange things so much better. I found also that the precedence of contingents was not easy. When I thought I had settled matters by ordering an alphabetical precedence for ceremonial parades I was met with a demand for the U.S. troops to march as Americans. The small internal difficulties of an Army were much magnified by the number of different codes—were they legal or with reference to sanitation or other discipline.

During the long winter frequent personal visits from the Commanders of all ranks to their commands was the best means of maintaining moral. Little scraps of authentic news were eagerly awaited. Perhaps, with the advent of wireless, even small columns in the desert or bush may be given each evening the football and racing news of the day. If that is achieved I can only say that it will be the most magnificent raiser of moral ever produced in war.

The means of transport were perhaps the most varied ever employed in the field. Sledges pulled by men, ponies, reindeer and dogs with the men on skis and snowshoes in the winter, and native carts and river craft from luxurious Thames steamers to coastal motor boats in the summer. For Command, Staff and Liaison work seaplanes were of inestimable value. On the innumerable lakes and rivers it was possible to land anywhere in summer, whereas aeroplanes found only bad landing places with a consequent increase in the number of crashes. With a seaplane it was possible to come down on the lines of communication and inspect a stoppage and be away again in a few minutes after an interview. For future river campaigns proper comfortable liaison seaplanes will be necessary, for it should not be forgotten that a commander does not commence his work until after he has landed and he should be as fresh as possible.

Before the ice had broken in April 1919, a decision was come to by the Supreme War Council that the Allied troops were to leave Archangel before the advent of winter in October of that

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year. Evacuation was no simple matter, for in addition to the 15,000 Allied troops there were some 15,000 to 20,000 civilians, men women and children, who had some claim to be evacuated to their homes. The majority of these people came from the newly constituted states in the Baltic and from Poland. The shipping available was not large, and evacuation could not start before May or June because of the ice conditions in the White Sea. Would the Russian mobilized troops be able to stand up after our departure? Would the evacuation of the Allied troops be able to take place under cover of these Russian troops, or would the whole affair have to be carried out as a military operation? These questions were by no means easy to settle, for the Russian troops were only half-trained and they might refuse to take over from us, when they saw us going away and deserting them, as they would probably think. The moral of these Russian troops depended a great deal upon what happened in Siberia with Kolchak. Could a junction with the Siberians be effected all would be well.

The British Government decided to run no risk, since they were responsible for the safe evacuation of several foreign contingents. Two strong mixed brigades of volunteer troops were therefore sent out to Archangel during May and June. Evacuation of all the civilians and of the Allied troops of the winter commenced at once and continued uninterruptedly till the end of August.

By May some 15,000 mobilized Russian troops had passed up to the various fronts to complete their training, and two of the lesser columns had been handed over to the Russian command. The two British Brigades took over the important fronts, and plans were got ready for disengaging operations, with a view to placing the Russians in as favourable positions as possible. It would certainly be cheaper in the long run if we could evacuate our final detachments peaceably.

Very soon it became evident that Kolchak was not doing well and that a junction with him was out of the question. The spirits of the Russians flagged visibly. The enemy redoubled his efforts at propaganda against the young troops, and unfortunately with good success. Two most serious mutinies took place, in one of which 5000 men passed over to the enemy after murdering their officers. Another took place in the 1st Bn. of the Slavo-British

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Legion, when portions of two companies murdered their officers at night and some 300 men passed over to the enemy. I should like to say one word about the Slavo-British Legion, for its failure to do good service was a bitter blow to us all. The original Russians who had joined the Allies in Archangel were formed into a Legion of some 500. Their numbers gradually dwindled and no fresh recruits were forthcoming. All through the winter we had been capturing large numbers of prisoners from the enemy, and after careful examination I found that the large majority of these men were peasants conscripted in other parts of Russia. It was impossible to maintain them in idleness in prison-camps owing to lack of accommodation and the necessary guards to watch them. The experiment was commenced of drafting them into companies and mixing them with the original volunteers who formed the officer and non-commissioned officer element. These companies fought well and proved themselves quite trustworthy. It was then decided to form battalions under British officers and to subject them to intensive training. After a couple of months training the 1st Bn. left for the front and I think I can honestly say that it was a very fine unit. The greatest care had been taken in the drafting of the men, but as experience showed we had allowed bad characters to slip through. The enemy had heard of this Legion and special men were sent across to pass into the units and cause them to mutiny. Time was against us in the experiment. It speaks volumes for what the gallant young British officers had done with their men, when I tell you that two companies and the M.G. company stood fast on parade while the mutiny was going on and afterwards cleaned up the situation. The attitude of the Russian authorities towards these British trained units had never been very friendly and I most reluctantly had to turn them into labour units. The Russian officers were against continuing to serve in these units and the British officers alone could never have gained sufficient touch with their men owing to language difficulties alone, and so the experiment came to an end.

The spirits of the mobilized Russians became so bad towards the end of August that I made plans to disarm them in the event of further trouble. I could not afford to fight them as well as the Bolsheviks during the evacuation. The situation was relieved,

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however, by a brilliant attack carried out by General Sadleir-Jackson's Brigade on the Dwina. By the time Lord Rawlinson arrived to superintend the evacuation of North Russia, the front on the Dwina was completely free of Bolsheviks and the Russians could take over in peace. On another front the Russians themselves carried out some very successful attacks, and our final embarkation was carried out without a shot being fired. The operation itself, though peaceful, was a fine example of naval work. Over 6000 fighting troops were picked up simultaneously from seven different points and the time-table for dropping down the Dwina was kept to the minute. Arrangements were even made for the picking up of any possible stragglers by tug-boats. It was well they were, for right in the middle of one of the great quays a tug-master found a solitary British soldier sitting on an officer's valise. Upon being hailed and asked what he was doing the reply came. "Beg pardon, Sir, but I'm Mr. Snodgrass' servant and he told me to wait here till he came back." Thus was rescued the last of the Allied Expedition to Archangel.

I think that we all left Archangel with a sigh of relief. We had certainly done our best under trying circumstances. We left without actively quarrelling with our late friends, if not wholly with honour, and we were certainly not to blame for the vagaries of the policies which had sent us there and taken us away.

There is one great lesson to be learnt from the campaign and that is, that it is almost impossible to limit the scope of a military expedition when once it has been launched. There are always demands for reinforcements which cannot be refused. The North Russian Expedition started with the landing of a few hundred marines at Murmansk and ended with some 50,000 troops of nine different nations advancing some hundreds of miles into Russia. (Applause.)

CHAIRMAN: Gentlemen, I hope some of you will ask the General questions, because one of the great advantages of these Lectures is that you can learn about things you want to find out for yourselves.

MAJOR PEASE-WATKIN: How do you keep aeroplane engines running at that temperature?

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GENERAL IRONSIDE: It was very difficult. They did keep them going with flameless lamps. We did get flying right through, except on the very worst days, but it was very difficult. The pilots had electrically heated clothing for their flights. Of course there are sudden drops in temperature. During snow, when the temperature is highest, you could not fly, but immediately after the snow, before the temperature had sunk down again, you could get in good flights. The landings, of course, were made on skis; all the aeroplanes were on skis and not wheels. One of the Gunner points in regard to cold that might interest you is this: To get your winter supply of ammunition you had to arrange for it to be sent out during the really very hot months of summer. Winter ammunition was then badly affected. On the very cold days we found that the range with 18 prs. was some 600 yards short in 2500, which is pretty considerable when you come to think of it. To get the right stuff to fire at the right moment was very very difficult indeed.

CHAIRMAN: It only remains now for me to thank General Ironside for the most interesting lecture he has given us. (Applause.)

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THE EVOLUTION OF ARTILLERY IN THE GREAT WAR.

VII.—THE EVOLUTION OF ARTILLERY TACTICS (3).

By Major (Bt. Lieut.-Colonel) A. F. Brooke, d.s.o., *p.s.c.*, R.A.

III. Period of Neutralisation.

IN the previous article we had reached the climax of the Period of Destruction as exemplified by the artillery tactics adopted at the third battle of Ypres. We had noticed, however, that during the latter part of this period attempts were made to regain the secrecy which had been lost through the length of our destructive preliminary bombardments. These attempts were meeting with serious opposition. We had established the fact that a limited success could be ensured with the tactics we were employing, whilst the suggested new method relied mainly on the neutralising properties of artillery which were not fully appreciated. Secrecy in the attack entailed the use of unregistered and unobserved fire in support of the attack. It was argued that in view of the necessary proximity between attacking troops and their supporting fire, registration could not be dispensed with. The new methods entailed both the sacrifice of the known advantage of destruction, and the risk of unregistered fire in the attack, consequently entailing grave responsibilities on a commander adopting such tactics.

The evolution of tank tactics had, however, exercised a direct bearing on the problem. Up to the present it has been unnecessary in these articles to consider the introduction of tanks, since the methods employed in handling this new arm called for no change in our artillery tactics. Although tanks had made their appearance in the latter stage of the battle of the Somme, yet from this time till the end of the third battle of Ypres they had been assigned a position in rear of the foremost attacking troops. Although

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possessed of exceptional wire crushing properties, this factor was not made full use of, and the artillery was left responsible for the destruction of wire obstacles. The shell torn nature of the ground on which the tanks had been employed had also militated against their efficient employment and led to false conceptions as to their supporting value in the attack. We had evidently in this new arm a means by which a proportion of the tasks of the artillery could be reduced, namely:—

(a) The wire entanglements could be rendered passable for infantry without previous artillery preparation.

(b) The hostile small arm fire could be neutralised by the automatic weapons of the tank, until such time as the assaulting troops were in a position to deal with it through their own means.

The above factors greatly simplified the problem confronting us. An efficient means of dealing with wire obstacles during the actual assault reduced the arguments in favour of a destructive preparation; whilst the neutralising properties of the automatic weapons of the tank also diminished the necessity for the close proximity of the supporting fire to the assaulting troops. Unregistered and unobserved fire, consequently, presented lesser dangers. The protection of the infantry during the attack would be partly taken over by the tanks, but whilst partially freed of this duty the artillery was confronted with the new problem of protecting the tanks.

1. *The battle of Cambrai.*

The new methods were put to the test at the battle of Cambrai, which proved conclusively their efficiency. The employment of tanks under suitable conditions, and in a tactical manner better calculated to derive the full advantages from this new weapon, enabled us to regain the lost secrecy. The preliminary bombardment was dispensed with entirely, whilst all previous registration of guns was equally abandoned. The strictest secrecy was enforced in all preparations for the attack. The normal artillery activity was maintained up to the moment of the attack to prevent the hostile counter-battery intelligence system from suspecting any alterations in the artillery dispositions. The absence of previous

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registration was compensated for by developing to the utmost the various methods for ensuring accuracy of unobserved fire, such as meteor reports, classifying and sorting of ammunition, accuracy of maps, employment of survey sections, and corrections for muzzle velocities, etc.

Secrecy in the deployment of the artillery was ensured by carrying out all moves under cover of darkness. Positions were selected, marked by pegs by survey company, and only occupied at the last possible moment. Ammunition dumps were concealed under all available cover, a free use was made of camouflage, and the surface of the ground left undisturbed.

The protection of the tanks during the attack presented new artillery problems to be solved. Small arm fire presented but small danger to the tanks, but on the other hand the hostile gun fire was of vital importance. The enemy's artillery had now become the primary objective of our own artillery. The absence of preliminary bombardment ensured greater accuracy in the information available as to the hostile artillery situation at the moment of attack, thus increasing the efficiency of neutralising counter-battery fire during the assault. But even with the most efficient counter-battery organisation it was impossible to locate silent hostile batteries and anti-tank guns. Evidently neutralisation of fire alone would not be sufficient, the hostile power of observation must also be reduced if the safety of the tanks was to be ensured. This result could best be attained by a free use of smoke screens. We find therefore both intense counter-battery neutralisation and a free use of smoke screens as two of the main tactical features in the artillery support of the attack. All known hostile battery positions were in the first place subjected to an intense period of neutralisation with lachrymatory gas shell. Some seventy 60 prs. were available for this task with an allotment of 16,000 rounds of ammunition. By forcing the hostile artillery to wear gas masks from the outset of the attack its efficiency was reduced. It is interesting to note that the original calculations for this task were based on the employment of 156 60 prs., a number which could not be rendered available. On completion of the gas neutralisation by 60 prs., these tasks were taken on by 6″ hows. firing H.E. whilst the 60 prs. were employed to sweep the approaches.

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To conceal the tanks from observation smoke shell were employed in two distinct methods. In the first place the composition of the actual barrage, fired by a density of one 18 pr. to 25 yds. of front, was altered to include a mixture of 1/3rd shrapnel, 1/3rd H.E., and 1/3rd smoke shell. The barrage was maintained some 300 yds. in advance of the tanks, and lifted from trench to trench and not by increments of 100 yds. In addition to the above various distinct smoke barrages were established on a total frontage of some 10,500 yds. No less than 18 field artillery brigades were allotted for this task, with a provision of 70,000 rds. 18 pr. and 23,000 rds. 4·5″ how. smoke shell. The intensity of the artillery barrage was increased by 6″ how. batteries firing on a general line 500 yds. in front of the tanks, whilst heavy howitzers opened concentrations of fire, for the first 15 minutes after zero, directed against all main centres of activity. Finally a detailed plan of long range harassing fire was arranged for long ranging guns.

Several important artillery lessons were gathered from this attack, which radically influenced our future tactics, and which may be briefly summarised as under :—

(a) The possibility of dispensing with previous artillery registration in the support of an attack.
(b) The rapidity with which operations could be staged, when preliminary bombardments were dispensed with, owing to the reduced quantities of ammunition required.
(c) The higher standard of artillery efficiency at the moment of the attack, owing to its energy being unimpaired by exertions of previous bombardment.
(d) The value of smoke in screening tanks during an attack.
(e) The difficulty of engaging single hostile anti-tank guns resolutely handled.

The above lessons were carefully studied and proved of great value in our offensive operations of 1918.

2. *The Battle of Riga.*

We have up to the present only examined the German artillery tactics as employed at the battle of Verdun in 1916. Since this

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date the offensive operations carried out on the Russian front had provided them with ample experience on which to frame the new artillery doctrines which proved so successful on the western front in 1918. If we take into consideration the fact that the Germans had not deemed it advisable to adopt the tank as a new offensive weapon, we may well ask ourselves how it was that without the assistance of the new arm they succeeded in gaining tactical successes on the western front in 1918, which compared favourably with those of our own forces? The answer to this question appears to lie almost entirely in the tactical methods which they had adopted in the handling of their artillery.

We have seen that the Germans had contemplated the use of trench mortars for siege operations prior to the commencement of hostilities. The advantages of such a weapon under conditions of trench warfare had been quickly recognised by them, with the result that both in the construction and use of these weapons the Germans retained a superiority throughout the war. Again, as the pioneers of gas warfare they had established and maintained the lead in the employment of gas through the medium of artillery. There is no doubt that these two factors were of great assistance in the majority of their successful offensives, but were not, in themselves alone, sufficient to account for the success gained. The true cause is to be found in the tactical methods employed, and which appear to have been mainly influenced by Colonel Bruchmuller, whom we have already seen classified by General Herr as "the commercial traveller in the handling of massed artillery."

The beginning of the war found Bruchmuller in command of a Guard Landwehr foot artillery battalion, and staff officer of the foot artillery of a fortress. By November, 1914, he became C.R.A. of the newly-formed 86 Division, and distinguished himself in the handling of the artillery at the battle of Narotchsee in 1917. He was subsequently employed in connection with the artillery preparations for attack on the eastern front in 1917, and finally appointed to the staff of the O.H.L. and entrusted with artillery plans for offensive operations on the western front in 1918.

As the battle of Riga affords the first example of the new German artillery tactics employed on a large scale, they are worth a moment's study. It should be noticed that this operation was

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carried out in September of 1917, and consequently prior to the date of our offensive at Cambrai. The operation is also of special interest as it entailed the crossing of the River Dvina, some 300 yds. broad; in view of the present tendency to select defensive positions protected against tanks by a river obstacle, this action provides an example of tactical methods independent of any tank assistance. Any deductions that may be drawn from the results of the attack should, however, be tempered by making due allowance for the inferiority of the fighting qualities of the Russian troops defending the river.

The attack was carried out by three German divisions on a front of some 9 kms. The crossing was, in the first place, carried out in boats, three bridges being subsequently erected. The attack was prepared by a bombardment of slightly over five hours' duration, which possessed the properties of a true hurricane bombardment, with real neutralising properties, extensive destruction was neither expected nor looked for.

The Germans were at this period undergoing a divergence of opinion as to the possibility of unregistered artillery support identical with those existing in our own and the French army. Although a school of thought existed favouring the use of predicted fire, rooted prejudices against such action were still in the majority. We therefore find at Riga a compromise between the two methods, the bombardment started at 4 a.m., but facilities were afforded for partial registration during the bombardment as soon as daylight admitted.

The country on the German bank of the R. Dvina was wooded and favoured the secret deployment of the 750 guns of all natures and 550 trench mortars destined to support the attack.

The artillery was organised as IKA, AKA, FEKA and SCHWEFLA. (See "The Evolution of Artillery Organisation and Command"—Royal Artillery Journal, Vol. LII, No. 3.)

Gas shell were extensively employed for this operation and used in the following proportions:—

AKA batteries (counter-batteries) rather more than 3/4 (Blue and Green Cross).

IKA ,, (infantry support) rather less than 1/5 (Blue and Green Cross).

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During the first two hours of the bombardment both AKA and IKA batteries were employed in gassing the hostile batteries, whilst three field howitzer batteries were specially employed in gassing command posts, O.P's, telephone exchanges, etc. At 6 a.m. the AKA batteries continued gassing hostile batteries, whilst IKA batteries engaged the infantry defences. The bombardment continued till 9.10 a.m. and was divided into four distinct periods during which various portions of the defence were subjected to different combinations of the hurricane bombardment. During the final 10 minutes a proportion of the AKA batteries left one gun firing on the hostile batteries, and concentrated the remainder of their fire on the front defences, with the object of assisting in covering the crossing of the river by the assaulting troops. We shall return to this nature of bombardment when studying the German offensives on the western front in 1918, it is therefore sufficient for the present to notice that it varied radically from the methods employed by us up to that date.

At 9.10 a.m. the attack started and was supported by a form of creeping barrage, which calls for no special remarks. The attack was a complete success. The defensive artillery fire was practically negligible, and only a few casualties were suffered in the erection of one of the three necessary bridges. Some of the Russian batteries are reported to have been panic stricken by the gas bombardment, and to have abandoned their guns. The operation was of the greatest value to the Germans since it provided them with a concrete example as to the results to be expected from their new tactical methods which we shall find firmly established by the Spring of 1918.

3. *Winter of 1917-18.*

The collapse of Russia and entry into the war by the Americans had now created a new strategical situation. We were thrown on the defensive until such time as the American forces should materialise.

Our artillery tactics of the defence had not up to date been subjected to any very severe tests. We saw the germ of the S.O.S. barrage taking shape during the winter of 1914. From then onwards the attacks to which we were subjected were usually of the

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nature of a counter-attack subsequent to one of our offensive operations, or in the shape of trench raids. In the former case we were provided with an "attack density" of artillery with which to meet the attack, whilst in the latter, the limited front of attack admitted of concentrations of fire being carried out through systems of mutual support. Our tactical deductions had consequently been in the majority of cases based on a density of artillery normally unavailable on an extended defensive front. We had grown to look upon defensive artillery fire in the shape of a rigid curtain of shells placed as near as possible to our front defences. With a density of at least one 18 pr. per 20 yds. of front, backed by medium and heavy artillery, such a procedure was calculated to stop hostile attacks before they could reach our front line troops. But a defensive density of one 18 pr. to some 300 yds. offered no resistance to a determined attack. Instructions were consequently published during the winter of 1917-18 laying down that in the defence artillery fire should be employed to deny the enemy important tactical features, whilst the intervening spaces should be allotted to machine gun and trench mortar protection. "Counter preparation" fire had also been introduced with the object of interfering with hostile preparations for the attack, and to engage the forming up places of attacking troops.

Our artillery tactics of the defence still retained too much rigidity both as regards time and place. The change from "counter preparation" to "defensive barrage" necessitated exact information as to the moment the hostile attack was launched. Such a procedure was possible in the case of an attack based on our own most recent conceptions and preceded by no preliminary bombardment. But the German hurricane bombardments of 1918 made it impossible to estimate the actual moment the attack was launched. Frequent S.O.S. signals were fired during the bombardments, continuous defensive barrages could not be maintained indefinitely, and it is probable that in many cases owing to interrupted communications the guns of the defence were only firing at slow rates at the critical moment.

In our endeavour to engage the leading elements of the hostile attack, were we not neglecting the fact that an attack to be successful must be organised in depth? By engaging hostile supports

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and reserves, which offered better targets for the artillery, the impetus of the attack could be checked, whilst the infantry disposed of the leading troops with their own weapons.

4. *German Offensives of 1918.*

We have seen that as a result of the successes obtained at Riga Colonel Bruchmuller was appointed to the staff of the German O.H.L., and entrusted with the artillery plans for the western offensive of 1918. The tactical methods employed consequently bear a striking resemblance to those which we have just examined.

The very greatest importance was attached to absolute secrecy in the deployment of the artillery for the attack. In the large scale attacks each assaulting corps had allotted to it approximately the front of one of the defensive divisions holding the line. All artillery preparations for the attack of the corps were entrusted to the C.R.A. of the defensive division. On the arrival of the attacking corps the C.R.A. of the division in the line became the commander of the "AKA," namely C.B.O. of the corps, whilst the senior foot artillery officer was selected a commander of the "FEKA," in charge of the harassing fire. Such a procedure facilitated the artillery preparations for the attack, and ensured that the commanders of both the "AKA" and "FEKA" were thoroughly familiar with conditions prevailing on the front of attack.

In order to ensure secrecy in the deployment of the artillery, batteries were classified in three categories:—

(a) Those that could be placed in position at once without any fear of detection.

(b) Those that could be hidden close to their ultimate positions, and man-handled into action on the night prior to the attack.

(c) Those which could only be placed into action on the night prior to the attack.

The latter category was reduced to a minimum to keep the roads clear for the attacking troops. Out of a total of 1100 batteries required for the attack of the 27th of May, only 20 batteries were classified under (c).

Although the attacks at Riga had proved that previous registra-

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tion could be partially dispensed with, strong prejudices still existed against such methods. During the preparations for the attack of the 21st of March one army is reported to have addressed a letter to the H.Q. of Prince Rupprecht's Army Group stating that :—"It wished to take exception to the new methods of attack supported by unregistered artillery fire, and to press to be allowed to order accurate registration." This request received the curt reply that :— "If registration must be carried out, the Army Group will not attack" ! The German opposition to the introduction of unregistered artillery support forms an interesting parallel to the unfavourable reception which such methods also received in our own army.

The German method of arriving at the required density of artillery to support an attack, were on the whole very similar to our own. In the first place at least one battery was allowed for each known hostile battery on the front of attack, with a few extra batteries to engage possible unlocated batteries. For the hurricane bombardment, calculations were based on the nature of the defensive system to be engaged combined with the necessity for maintaining several successive lines simultaneously under fire. A frontage of 100 to 150 yds. per battery was considered adequate, whilst extra batteries were added to engage command posts, observation stations, machine gun nests, etc. For the large scale offensive of 1918 Bruchmuller states that the demand for guns always exceeded the number available, in spite of Ludendorff's special efforts.

As regards the selection of types of equipment for the various tasks it is interesting to note that during the last one and a half years of the war field guns were extensively used for counter-battery work. This was due to the fact that the large numbers available, combined with their rapid rate of fire, rendered them especially suitable for firing gas shell. Such a procedure also liberated a larger number of howitzer batteries to engage the more distant battery emplacements. Trench mortars were definitely recognised as a wire cutting weapon, whilst great reliance was placed in the moral effect of these weapons when participating in the hurricane bombardments. These weapons were used whenever their limited range admitted of their efficient use, an allowance of one medium or heavy mortar being made for every 25 to 30 yds. of the front of attack.

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Each attack was preceded by a typical hurricane bombardment. The object of such a bombardment is indicated by the literal translation of its German name, namely the "Assault-ripe-making-fire." The following extract from Bruchmuller's book also shows clearly that destructive results were not sought for in such bombardments. He states :—"With a preparation of only a few hours, naturally no complete destruction of the enemy's trenches and obstacles could be expected. That was also certainly not the intention. One wanted to shatter the moral of the enemy by the fire of the artillery, to banish him to the bottom of his trenches and dugouts, and by an unexpected assault to overcome him." From the above it is clear that the tactical methods employed aimed at effects of neutralisation and not of destruction.

The moral, and disorganising, effect of the bombardment was in itself not considered sufficient, and the tactical handling of the artillery was therefore so organised as to induce the defenders to remain hidden in their shelters even when the fire was temporarily withdrawn. This was achieved by carefully timed barrage lifts during the preliminary bombardment, by which successive trenches were uncovered temporarily only to be subjected to a crushing return of the barrage. The fire was repeatedly withdrawn from the forward defences whilst the assaulting troops waved their helmets and shouted in order to induce the defenders to man their parapets only to be met by a return of the fire. Finally, at the moment of the attack the assault was launched with no appreciable alteration in the intensity of the bombardment.

The distribution of the artillery fire during the hurricane bombardment varied somewhat in the various offensive operations, but was generally speaking sub-divided into three distinct phases :—

(a) A general bombardment of all defences, battery positions, command posts, telephone exchanges, billets and headquarters, carried out as far as possible with gas shell.

(b) All AKA and the majority of the IKA batteries were concentrated on hostile guns, with the object of placing the hostile artillery temporarily out of action; namely an intensive counter-battery phase.

(c) IKA batteries returned to the infantry defences, alternating from one line to another, whilst the AKA, FEKA and SCHEFLA settled down to their respective tasks.

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Turning now to the support of the actual attack we find that the German tactics were on the whole very similar to those prevailing in our own army at that time. The whole of the IKA batteries and a proportion of the AKA batteries were brought on to the front line of defences during the final stages of the hurricane bombardment, whilst the attacking troops left their shelters and closed in on the line of bursting shell. This barrage, or "fire-roller" as it was known in the German army, moved forward in bounds varying from 50 to 200 yds. These lifts were originally regulated by light signals, but as such a procedure apparently proved unsatisfactory a true time programme was resorted to, whilst in the final attacks attempts were made to regulate the lifts by a combination of time and light signals. The rate of the barrage was definitely fixed, but battalion commanders were provided with light signals and authorised to make use of them on certain stipulated lines to increase the rate of the barrage if necessary.

For the attack of the 27th of May on the Chemin des Dames a double barrage was provided. The IKA batteries were subdivided into two groups, IKA (a) and IKA (b), the former fired mainly H.E. ammunition, whilst the latter fired non-persistent gas shell (Blue cross), and were directed against definite systems of defence at least 600 yds. in front of the attacking infantry.

The Germans had apparently found no better solution to the problem of close support during the attack than we had. Definite batteries were maintained limbered up for close support purposes, and destined to follow close on the heels of the infantry. These batteries were provided with special assistance of pioneers to help them in crossing obstacles. They are reported to have rendered valuable services, but to have suffered extremely high casualties in doing so.

The above rapid survey of the German artillery tactics in their offensive operations of 1918 can necessarily only be of a superficial nature. It should, however, be sufficient to illustrate the main differences existing between these methods and the ones we were employing. When we take into account the tactical successes gained by the use of such methods, it is of interest to consider whether it would not have been possible for us to adopt similar ones in 1917, and the probable results of such a procedure.

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5. *French Defensive Operations in Champagne (July 15-18).*

A few moments may well be devoted to examine the final failure of the German offensive methods, and the singular success of the French defence.

In the first place it should be noticed that the German secrecy measures, which had up to date been such a conspicuous feature, showed the first signs of deterioration. The fact may have been partly due to over-confidence, partly to carelessness engendered by fatigue, and partly to a series of unfortunate circumstances. Whatever the causes may have been, the results were disastrous to the success of the operation. By the 6th July the French held fairly accurate information as to the impending attack. From this date onwards they carried out careful artillery counter preparation, and drew up the necessary measures to meet the attack. Special arrangements were made for the withdrawal of the troops from the forward zone, and for a corresponding application of the defensive artillery fire.

On July 14th at 2200 hours 27 prisoners were captured in a raid, and from their interrogation information was obtained that the German attack was to take place that night, preceded by a hurricane bombardment lasting from three to four hours, and commencing at 0010 hours. From 2300 to 2340 hours all the French artillery opened fire against the German batteries and assembly areas. At 0445 hours the Germans launched their attack on a 90 km. front. As a result of the French defensive measures the attack was in most places brought to a standstill against the main line of resistance. Although the main causes of failure of the attack must be attributable to loss of secrecy, there are however a few minor causes which are of interest. Owing to the shortage of artillery required to stage an attack on so wide a front, extra guns had been issued to German batteries raising them to five and six guns. The necessary personnel to man these guns had been found from ammunition columns, parks, etc. This dilution of personnel reduced the efficiency of the artillery which was also showing distinct signs of weariness owing to the continuous offensive operations it had been engaged in, and probably reacted unfavourably on the artillery support of the attack. The failure cannot, however, be solely attributed to either the tactics or efficiency of the German artillery in this attack.

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6. *Amiens Offensive (August 8th).*

The battle of Cambrai had proved to us that by employing tanks, and dispensing with previous artillery registration, the element of surprise could be regained in our methods of attack. On July 4th at Hamel these methods had again been put to the test and proved successful. The French had also quickly followed up the German failures in Champagne with an attack on the Chateau Thierry—Soissons front on the 18th of July, supported by over 500 tanks and with no previous artillery preparation.

Opinions are occasionally expressed that the introduction of the tank in the attacks of 1918 had replaced the action of the artillery by overcoming the hostile obstacles and machine guns. A study of these battles shows that the density of artillery supporting the attack was in no appreciable extent less than in those of 1917. Although the frontage per gun supporting the attacks appear less, it should be remembered that owing to the existing conditions and lack of preliminary bombardment the percentage of guns in action at the moment of the assault was far greater. For instance, in the Passchendaele attack of 1917 only 75% of 18 prs., 65% of 6″ hows., and 35% of 60 prs., were in action at the time of the attack, whereas on the 8th of August at Amiens 98·5% of the allotted strength of artillery was in action on the day of the attack.

In the attack at Hamel 10% of smoke shell had been used in the barrage, but did not prove entirely satisfactory, the general impression being that the smoke had hampered our own powers of observation without compensating advantages. For the Amiens attack a total of 30,000 rounds 18 pr. smoke and 24,000 4·5″ how. had been allowed. Owing to the experience gained at Hamel, and the dry nature of the ground, it was considered that shrapnel shell alone would provide sufficient screening effect. The decision was, however, altered at the last moment owing to heavy rain, and a proportion of smoke shell included in the barrage.

The importance attached to efficient neutralisation of the hostile artillery as a protection to the tanks is exemplified by the allotment of 2/3rds of the available heavy and medium artillery for counter-battery purposes. The use of gas shell was not as extensive as might have been expected, only 10,000 rounds 4·5″ how. and 50,000 rounds 6″ how. being used. The efficiency of the

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neutralisation of the hostile artillery was proved by the fact that in several of the captured batteries the muzzle covers were still on the guns, the personnel intended to man these guns had evidently been either unable or unwilling to take post at their guns.

The following extract from the D.M.S. Fourth Army official report also bears testimony to the efficiency of the neutralisation of the hostile artillery :—"During recent operations on this army front, it has been noticed that there were very few cases of shrapnel wounds among British troops, about 70% being rifle and machine gun bullets and about 27% shell wounds. On the other hand, the wounds among German wounded prisoners show an exceptionally high percentage of shrapnel wounds."

The necessity for elasticity of control in the artillery in attacks of this nature is well exemplified by the methods adopted. During the process of preparation extreme centralisation existed. The army laying down the main outline and restrictions for the deployment of the artillery, and support of the attack, whilst corps controlled the details of these dispositions within their respective spheres. From the moment the attacks started, the process of decentralisation started and the artillery advanced in three echelons :—

(a) One field brigade with each division to furnish direct close support. These brigades crossed the original front line on an average of 1½ hours after the commencement of the operations.

(b) The second echelon consisted of the other field artillery brigade of each division, one 60 pr. battery and one 6″ how. battery. These batteries moved forward directly the final protective barrage had been fired, and remained under the direct orders of the C.R.A's of divisions.

(c) The third echelon comprised the heavy and medium artillery brigades and all army field artillery brigades, these all remained under corps control, ready to be allotted to divisions when and where required.

Throughout the attacks of 1918 we find all belligerents endeavouring to solve the question of close support artillery. However perfect the original plan for the artillery support of the attack, occasions always arose when additional fire power was required at

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short notice to deal with special points of resistance which had escaped the main artillery fire. The true solution to this problem probably lies in the improvement of our methods of intercommunication and the production of a system independent of all wires. As these did not exist we were compelled to place a proportion of our artillery sufficiently close to the attacking troops to ensure the close intercommunication necessary. On August 8th complete batteries were employed, in subsequent attacks sections and single guns were substituted, in each case the same difficulties were encountered, namely that of operating unarmoured artillery within the zone of small arm fire. The problem still remains unsolved for the present, but with recent improvements in wireless telephone and in armoured track vehicles the solution should not be distant.

7. *Allied Offensive of 1918.*

No striking changes in artillery tactics are to be found during the final stage of the war, as represented by the allied general advance. The new tactical methods which we had adopted were producing the results we had been striving for during the past four years. Our enemy was rapidly losing his fighting efficiency and his powers of resistance were deteriorating. The main incentives for further evolution were consequently gone. We only find a few changes in minor artillery tactics, introduced with the object of perfecting our new methods, and adapting them to the more mobile nature of the warfare we found ourselves engaged in.

The most important of these lay in connection with the elasticity in the control of artillery required by the more mobile nature of the operations. Our advance consisted of alternating periods of relatively rapid progress against minor opposition, followed by deliberate attacks against definite lines of resistance. During the mobile periods it was essential to resort to extreme decentralisation in order to provide the necessary liaison between attacking troops and supporting artillery. Corps decentralised a proportion of the medium artillery to divisions, whilst these in their turn allotted a proportion of the divisional artillery to infantry brigades, sections and single guns being finally assigned to battalions. As the enemy succeeded in organising a crust of defensive fire power under cover of the delaying rearguards, the

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mobile phase slowed down, finally necessitating deliberate operations. In order to avoid any unnecessary delay in the staging of these attacks, it was essential that the artillery staffs of all formations should be continually looking forward with the object of d· termining the next serious line of resistance. This was especially the case in connection with counter-battery staffs. During the mob le phase the C.B. S.O. was unable to control the counter-battery work of the corps, which consequently depended on the individual efforts of divisional artilleries. It was, however, of vital importance for the C.B. S.O. to keep himself in continual touch with the hostile artillery situation, and to regulate the moves of flash spotting and sound ranging sections, so as to admit of co-ordinated counter-battery work being resumed without delay as soon as the hostile resistance stiffened.

Although the majority of the operations carried out during this final phase of the war were based on the tactical methods adopted for the 8th of August attack, yet two operations are worthy of a moment's consideration as they present certain special features. The first case is in connection with the attack of the Hindenburg Line by the Fourth Army on September 26th. This line had never been subjected to any serious bombardment on this portion of the front, and lay for the most part east of the canal, and consequently partially protected from tank attack. It was also known to be very strongly protected by wire entanglements and furnished with strong concrete machine gun emplacements well covered with earth. The situation existing was radically different from that prevailing on August 8th, the general allied offensive was now in progress along the whole of the front, consequently surprise was no longer of paramount importance. The attack was therefore preceded by a 56 hours' bombardment, the first 8 hours consisting of concentrations of gas shell on localities of activity such as headquarters and battery positions. Mustard gas was employed by us for the first time in this bombardment, some 26,000 rds. of 18 pr. and 6000 rds. 4·5″ how. being used. The results, according to prisoners' statements, produced a wide, though not heavy, distribution of gas casualties. The attack on a front of 21,000 yds. was supported by 1050 field guns and 590 heavy guns, giving a density of one field gun to every 21 yds. of front. The point of interest

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to be noted is the fact that the altered circumstances, such as, the general allied offensive, lack of hostile strategical reserves, and offensive operations on the flanks, no longer rendered a strategic surprise of paramount importance; a tactical surprise alone was necessary. Even under these conditions no attempt was made at a systematic destruction of the defences, lanes only were cut through the wire, and main artillery effort was directed towards further reducing the declining moral of the enemy and his power of resistance.

The second case worthy of notice is of interest owing to the example which it affords of the employment of artillery as a means of economising man power in battle. The attack in question was carried out on November 1st, within ten days of the Armistice, by the Canadian Corps in the capture of Valenciennes. The troops engaged in the attack consisted only of the 10th Canadian Infantry Brigade, but owing to the salient formed by the German line at this point, practically the whole of the artillery of the corps was available to support the attack. Although the front of attack was only some 2500 yds., 144 field guns and 104 medium and heavy guns were available to support an infantry brigade reduced to a total strength of some 1500 rifles. The proportion of guns to attacking troops was consequently approximately one gun to every six men, whilst if the weight of ammunition fired be taken into account we find that each infantry soldier was supported by approximately $1\frac{1}{2}$ tons of shell. The circumstances admitting of such a concentration of artillery were no doubt exceptional, but the results achieved certainly justified its employment. The success of the operation can best be judged by examining the following comparative casualties incurred during the operation.

Germans.

Killed (actually buried)	800
Wounded prisoners	75
Unwounded prisoners	1379
Total ...	2254

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Canadian.

Killed	60
Wounded	380
Missing	61
Total ...	501

The facilities for combined enfilade and frontal barrages materially assisted in the efficiency of the artillery fire in this attack. The operation is, however, of special interest in providing a concrete example of the possibilities of economising man power through mechanical means. Guns and ammunition no doubt require time and money for their production, these factors are, however, only trivial when compared with those entailed in the production of the fighting man.

8. *Conclusion.*

In the brief survey of artillery actions of the Great War which we have just completed, an attempt has been made to draw attention to the ever increasing importance of fire power in modern battle. We saw in the first stages a false appreciation as to the required strength of this fire power, secondly a misapplication of the new fire power which we created, and only finally, after many costly errors, did we arrive at a correct method of its employment.

A distinct tendency exists to look upon tactics as only embracing the actual movements of troops in the field of battle. This is probably due to the fact that, as compared to the other arms, the artillery may be considered as still in its infancy. The short ranging days of its childhood have, however, been outgrown. It is now capable of manœuvring its fire power within the field of battle with greater ease and far greater rapidity than any troop movements can be executed. It is with the reserves of artillery fire power that a commander can rapidly influence the course of operations. Should not, therefore, the manœuvre of fire receive equal attention to the manœuvre of troops? In modern war the most perfect tactical handling of troops is liable to failure if the manœuvre of the supporting fire is neglected. In peace we are still able to reproduce and study the effect of the tactical movement

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of troops. Unfortunately the effect of the manœuvre of fire power must remain hidden from us till the next war, and consequently deserves the very closest study from examples in recent history.

The opinion is frequently expressed that the period of static warfare on the western front during the last war presents but few tactical lessons. That the only possible tactical methods consisted of direct frontal attacks, with no flanks, no lines of communications to attack, and no possibility for tactical manœuvre. It is hoped that the very incomplete study of the evolution of artillery during the Great War may assist us in appreciating some of the lessons in the tactical handling of artillery which the Great War provides.

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THE IDEAL ARMY OF THE ARTILLERY CYCLE.

By Colonel J. F. C. Fuller, D.S.O.

Introduction.

It is a fact which is beyond dispute that military organisation underwent marked changes during the war, and that the armies of 1918 were very different from the armies of 1914. Had the war continued to 1922, the armies of that date would have been still more different; and had it continued to 1926, we may well infer that those of 1926 would have been so different from those of 1914 that the two organisations would be scarcely recognisable.

To-day military organisation still closely resembles that of 1914, consequently, if we bear the above evolution in mind, we may conclude that there is room for improvement. During the war, Necessity, as always, was the mother of invention, demand created supply, and evolution, however haphazard, was rapid, for war is a struggle for existence in which comparatively only the fittest organisations survive. In peace time there is no necessity, there is no tactical struggle, consequently unless evolution is to be excessively slow, we must replace Necessity by Hypothesis, and tactical struggle by logical thinking. We must become rational visionaries.

Since the war much experimental work has been carried out in the greater armies. A number of weapons of war each embodying an idea has been produced, but, as far as I am aware, no attempt has been made to co-ordinate these ideas by establishing a common goal towards which all should converge. What at present is lacking is a key-plan to work to, and without such a plan it may one day be found that it is impossible to organise the inventions introduced during peace time, that is to fit the parts together so that they will produce one co-operative whole.

It is my intention in this paper to outline such a plan, if only in embryo, a plan which though it can be no more than an ideal is sufficiently well-founded tactically and organically to permit of it being applied to the more general conditions which will confront an army in a great war. To examine the special and particular

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conditions which face individual nations is outside the question, yet it must be remembered that, before the ideal can be transformed into the real, these conditions will have to be examined and weighed out.

As in all countries money is insufficient to allow of the constant change which Necessity forces on us during war-time, I have no option but to look well ahead. It is useless laying down what an army should be like in 1930, for when the year 1930 arrives it will have to be changed to what it should be like in 1935, and then later on to 1940, 1945, and so on. We must not however look too far ahead, therefore, I will fix my model at the year 1946. This permits of 20 years to work in, and though it is not possible to see *in detail* what an army of 1946 will, or should, look like, failing some unknown and revolutionary scientific discovery, it is possible to base the ideal model on sound tactical principles, and to do so we must examine very carefully a whole host of changes.

I. Changes in Conditions.

1. The Lessons of the Great War.

All wars are problems of movement, which is tactically gained by protected offensive action. The last great war offers no exception to this rule, for in spite of its static nature it was a prolonged struggle to establish mobility. Movement was its predominating problem, yet, in spite of this, all nations are to-day less well prepared for a war of movement than they were in 1914, since military organisation has not radically changed and yet has become more complex. The 1914 organisation led to static warfare, since fire-power was more than human nature could endure. To-day small arm fire is, generally speaking, three times as great as it was in 1914, yet protective power is about the same, since artillery power has changed but little,[1] and tank power is insignificant. Consequently whatever may be the doctrines laid down in the training manuals, the main tactical problem in a great war remains static warfare.

Since 1914 fire-power has increased, and protective power, which should be the base of fire power, has remained much as

[1] Though great improvements have been made in gun construction since 1918, the number of guns in all great armies has been drastically cut down.

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it was, consequently, tactical mobility is actually less than it was in 1914. The reason for this shortsightedness is that the supreme factor which differentiated the last war from all preceding wars, namely, the petrol engine, has been overlooked. It was not increase in fire-power which enabled the Allied Armies to move forward in 1918, but the increased protective power rendered possible through the high horse-power of the petrol engine. Once half an inch of steel could be carried before the soldier, his fire-power was multiplied many thousands of times, because this half inch of steel reduced the enemy's small arm fire almost to zero. The supreme military mistake of 1919 (one made after each great war in history) was that nations were so blind to the most important lesson of the war—protected mobility—that in place of reorganising their armies according to this lesson they returned to their pre-war organisations.

In the past, military organisation has evolved on the costly system of trial and error, coupled with the omission to disband war-raised units, and tempered by imitating foreign innovations. It has been a grossly inefficient system and extravagantly expensive. In our own history, however, two remarkable exceptions to this blind process of development are to be found, namely, Cromwell's "New Model" and Moore's "Light Brigade." The second had a stupendous influence on our army, and was the most important tactical factor in undermining the power of Napoleon. Once Moore's system was generally established the British Army for five years never suffered defeat.

Moore's system was rational and not blind. It was based on *observed* trial and error, that is on experiment, the aim of which was to explore and develop *a definite idea.* His idea was that of an organisation which could move rapidly and which in movement would be better protected than that of any Continental Power. He built a machine to carry out an idea, and not the parts of a machine from which ideas might or might not be developed. Without this idea his work would have been blind.

2. Changes in Strategical Conditions.

Before reconstruction can be directed along economical lines, the idea which should control the work must first be determined.

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This is not a difficult problem to solve, since a study of history will show that this idea has never radically changed, it is the idea grasped by Moore, or for aught that by Alexander, it is rapid and secure movement in whatever direction is determined on. If an army can move twice as fast as its adversary, and is so strongly protected that it loses but one man to his two, then it will have twice as much time at its disposal, and, in comparison to its enemy's strength, its own will be double its muster role. *Secure movement* should consequently be the tactical pole-star of the military organiser.

Though this idea is fundamental to the maintenance of economy of force, its development into a concrete organisation is dependent on the conditions which surround us. Hitherto strategy and tactics have been in nature linear. Armies have marched by road or have been conveyed by rail, and line has met line on the battlefield. To turn a line or to attack a line in rear has always been a difficult operation. In early days it was possible to do so with cavalry; in recent times only by overlapping, or by the advance of a separate army, consequently large numbers of men were required. The result has been that most attacks have been frontal, and as fire-power has increased these attacks have become so costly, that to-day the infantry assault is almost as rare as the cavalry charge. Concurrently with this increase in fire-power we find army organisation growing more and more complex, not only tactically, but administratively. So much so has this become the case, that fear of exposing the rear services to destruction, not so much through enemy action *as through change of position laterally*, has restricted manœuvre, and has compelled armies to move forward with their fronts at right angles to their communications in order to secure them, and in order to avoid any lateral change in their positions. As manœuvre has been restricted, and as the assault has lost its power, frontal attacks have grown into prolonged operations of attrition in which leadership and command have been replaced by moral endurance and material supply. In the last great war, as long as the enemy's front remained intact, generally speaking his rear remained secure.

To-day this condition no longer holds good, for aircraft can fly over existing armies and attack them in rear; tanks can break their front, and armoured cars can rapidly envelop their flanks and

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attack their rear services—their stomach. We know that these operations are possible since during the last year of the war they were carried out with astonishing success. The rear attack has now become a feasible operation, and will in my opinion become the governing tactical operation in war. What does this mean? It means that in the future, battles will not be fought in more or less rigid lines, but over areas. Fronts may be anywhere, flanks may be anywhere, as at sea, but the rear will remain that point which is closest to the main base of supply—again as in naval warfare. Armies must consequently be organised to attack or protect this point, not by forming a front at right angles to the communications leading to it, for all fronts will be hypothetical until contact takes place, but by possessing "locomobility," that is power to move and to secure movement in any direction over a given area.

Our present idea of mobility must be advanced in degree to cover not only an expanding and contracting area, but also a moving cube, since aircraft can move in three dimensions. At any point in this area, or in this cube, we must possess the power of concentrating superiority of force. It is not so much numbers which will enable us to do this as movement. If an army can move three times as fast as its enemy, then, other things being equal, 20,000 men will defeat 60,000, possibly 160,000. This is the reason why Alexander always defeated the Persians, even when they outnumbered him by twenty to one. His secret was secure mobility, and secure mobility is the mainspring of concentration of force.

3. Changes in Administrative Conditions.

The change over from linear to area strategy will demand radical changes in tactics, and consequently in organisation. Organisation is three-fold: it is tactical, administrative and managerial. Tactical strength depends on fighting power which is based on freedom to supply the combatant portion of the army. The first problem is therefore an administrative one, including bases of supply and lines of communication. There are three main categories of bases, namely, main bases (which in our wars are generally coastal); advanced bases, such as rail-heads; and mobile receiving depots, or field bases, which are in the immediate rear of the fighting troops. In linear warfare the problem is com-

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paratively a simple one; the army moves forward and deploys, and its deployment protects its rear organisation by offering to the enemy a front which must be attacked or circumvented, the last mentioned operation being, as I have shown, an exceedingly difficult one in this type of warfare. In area warfare, comparatively speaking, it is easy, and unless the rear organisation of an army is self-protective and mobile it will offer a tempting objective to an enterprising foe. The rear attack is therefore likely to become *a normal operation of war*, and if it succeed an army may be exterminated before it is able to fire a shot.

The rear attack will and must radically modify our present-day conception of field administration. Main bases[1] must as heretofore remain static, they cannot be moved since factories and harbour accommodation cannot be shifted; they can only be abandoned. In area warfare as a deployed army can no longer guarantee the protection of its advanced base, or bases, these must be self-protective, and as a battle may be fought at any point in the area of war, they must be sufficiently mobile to permit of their positions being shifted so that the freedom of movement of the field army is not restricted. In linear warfare armies have frequently manœuvred in order to protect their bases, in area warfare this operation will be reversed, and the side which can reverse it more fully will possess a tremendous advantage over its antagonist. Whilst main bases must become fixed fortresses, advanced bases must become mobile fortresses. In this last conception there is nothing new, for it is but a return to the mediæval laager which was normally drawn up behind the battle array. As in the case of the laager these advanced bases must not only be able to supply the fighting forces, but must offer them shelter when they require to refit—in fact they may be compared to land "floating-docks."

The supply of these mobile fortresses may be by road, rail, or across country. The lines of communication leading to them may be attacked from any direction, especially if they are static—roads or railways—consequently their supply must be carried out by protected convoys working from the fixed main base. Should the

[1] Main bases may be divided into two categories :—
(a) Coastal bases such as the port of Havre during the war ;
(b) Industrial centres, such as the Ruhr or the Bruay coal-fields.

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distance between the main base and the advanced base become too great, intermediary fixed bases, or defended depots, must be established, these forming temporary "land-ports."

The administrative problem is no longer one of peaceful movement behind a protective screen—the field army, for in area warfare administration and tactics are more closely interknit. The administrative troops must not only be able to supply the field army, but protect themselves against air attack and mechanical raids, they must become more and more fighting troops so that the combatant portion of the army may possess freedom of manœuvre.

4. Changes in Tactical Conditions.

The administrative services having been so organised that freedom of manœuvre is possible, the next problem to solve is one of tactics. It is not a new problem, it is an old one in changed form. The enemy must be found; his power to move must be restricted, and finally his power to fight must be destroyed. Thus we get three definite tactical acts—finding, fixing and destroying. To find an enemy demands reconnaissance, and as in area warfare he will not be so intimately tied to fixed lines of communication, this duty will become a more complex one. To fix him, that is to restrict his movement, as heretofore, will demand either clinching with him, or threatening his base of supply, or his lines of communication. Clinching will be much as it has been, but, if the enemy's administrative organisation is mobile, threatening will become more complex, also if his advanced base is threatened, or even besieged, it will frequently be possible for him to improvise or establish another, and so retain his initiative.

In the third act, namely that of destruction, we find a remarkable change. The old method, in nine battles out of ten, resulted in a frontal attack, yet it was clearly recognised that flank attacks were more decisive, and rear attacks more decisive still. The new method will avoid the frontal attack, and will aim at a flank attack supplemented by a rear attack, or when feasible by a rear attack only. Surprise and not numbers will once again become the predominant factor. The destroying force must consequently be extremely mobile, and its mobility will depend quite as much on its power to fix the enemy as on its speed. Further, as it must

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depend for its maintenance on its advanced base, this must be equally mobile, or as mobile as possible. Superiority of mobility and not mass of numbers is the supreme tactical problem of area warfare.

The problem of management, that is command and intercommunication, I will not examine here, for since the general adoption of wireless telegraphy and telephony, area inter-communication has been established. It is no longer necessary to know where a recipient is, for wherever he is he can be communicated with. In management, few radical changes are likely to arise.

5. Changes in Tactical Means.

From the above we see that in area warfare as in linear we get three essential forces, forces which can discover the enemy, forces which can detain him, and forces which can destroy him. In former days these forces were represented by light infantry, infantry and cavalry, each, and more particularly the second, being supported by artillery. The tactical base of light infantry action was the ground itself, for their security mainly lay in skilful use of ground, and in presenting but a small target to the enemy. The tactical base of infantry was artillery, and of cavalry—the infantry and artillery action; the main power of cavalry resting on their mobility, which enabled them to take advantage of opportunities created by the infantry and artillery battle.

In recent years cavalry as the arm of destruction has become almost useless, light infantry have vanished altogether, and battles have become infantry and artillery duels in which superiority of numbers more so than any other factor has become the deciding force. Armies are defeated, but they are seldom destroyed unless they lock themselves up in fortresses, when destruction of a fighting force is attained through surrender. In fact we see during the last hundred years, in spite of the stupendous improvement in weapons, a steady decline in the art of war, until in the Great War it disappears—there is no art, there is only brute force.

To-day the main problem in tactical organisation is to re-establish the essential threefold order of fighting, and the petrol engine enables this to be done, for its power permits of the carriage of armour, and so cancels out the bullet which in recent years has been the chief impediment to movement.

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We start with light infantry, infantry and cavalry as the three essential arms protected by artillery which is common to all three. Therefore, if these are to be placed on a petrol footing, scout machines, assault machines and pursuit machines will be required, each if necessary protected by an artillery machine. I will examine these four categories in turn.

The scout machine should be as small as possible and as fast as possible, which are not altogether compatible qualities. The assault machine should be heavily armoured; without considerable sacrifice of speed it cannot be made proof against armour-piercing shell, but it should carry armour of sufficient thickness to protect it at moderately close ranges from such heavy automatic fire as may be developed from the enemy's scout machines. In my opinion, as time goes on this machine will in nature approximate more and more to the present conception of the artillery machine, until the two may quite possibly coincide. If this takes place, then I think that the present conception of artillery protecting the assault arm (to-day infantry) will be replaced by the older conception of the scout machines protecting the artillery machines which have replaced the assault machines, just as years ago light infantry protected the heavy infantry of the line. This will probably lead to two types of scout machines, namely, the scout machine proper which is used to reconnoitre, and the destroyer machine which is used to protect the artillery assault machines from close attack, much as destroyers protect battleships at sea.

Until such time as the assault machine and the artillery machine coincide, which I believe they will do, since there is little place in a battle between machines for any but light high velocity guns, the artillery machine must be able to destroy the assault machine and to cover its advance.

The pursuit machine should be the fastest machine of all; it should be lightly armoured, should possess a long radius of action, and be self supplying for several days.

From the three tactical essentials of hitting, guarding, and moving may thus be developed three categories of machines, each of one or two classes, namely :—

(i) (a) The scout machine, the duty of which is to reconnoitre (light cavalry).

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(b) The destroyer machine, the duty of which is to protect the assault machines (light infantry).

(ii) (a) The assault machine, the duty of which is to disrupt the enemy's organisation (infantry).

(b) The artillery machine, the duty of which is to protect the assault machine until such time as this machine can develop its own protection (artillery).

(iii) (a) The pursuit machine, the duty of which is to follow up victory by exploitation (cavalry).

(b) The chemical warfare and bridging pursuit machine, the duty of which is to restrict or facilitate movement, in the first case by vesicant and other gas inundations; in the second by bridging (engineers).

Having now considered tactical changes related to means of movement and protective power, for all these machines will be armoured, I will briefly consider weapon power, and here we are confronted by a very interesting problem. Before the outbreak of the Great War three categories of weapons were to be found in all civilised armies, namely, assault weapons (bayonet, lance and sword), in-fighting weapons (rifles and machine guns), and out-fighting weapons (all manner of artillery). During the war a fourth weapon—gas—was added to these. Of all weapons this last one is likely to become the most potent against a muscularly moved army, but against a mechanical army it becomes largely impotent, as the man is shielded against vesicant gases, and, if necessary, a machine such as a tank can be rendered gas-proof. It is for this reason that I do not think that gas will prove a useful weapon against a mechanical target, but dropped from aircraft against non-mechanical targets its effectiveness can scarcely be exaggerated. As regards the *arme blanche*, obviously the bayonet, sword and lance can play no part in the tank battle, and it is equally obvious that the rifle and small-bore machine gun can only play a minor part. We are left, therefore, with artillery *as the principal arm of the future.*

It is curious how history is apt to repeat itself. The general introduction of armour in the fifth century A.D. resulted in infantry playing a very minor role in battle for a thousand years. The reintroduction of armour in the near future, will, so I think, lead

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to a similar result, and as gunpowder introduced the great infantry epoch of war, a period extending from about the middle of the fifteenth century to to-day, so will petrol introduce the great artillery epoch. The superior weapon of the future *is the gun*, the superior soldier *is the gunner*, and the superior army *is a force based on mechanically-propelled artillery*. To-day we stand on the threshold of this third great tactical cycle—the artillery cycle.

If this deduction is a logical one, the next question which confronts us is: What types of cannon will be required in a mechanical army? To-day existing weapons are fitted into newly conceived machines. These weapons were built for a definite purpose, namely, a muscularly moved army, therefore *a priori* we may consider them defective. In the past the main tendencies of gun evolution have been towards greater range, greater weight of shell and greater accuracy and rate of fire. But in the mechanical battles of the future, range will mainly be limited to visibility of target, consequently direct and not indirect laying will be the order of the day. Weight of shell will be limited by the armour piercing effect required, and not by fragmentation and strength of explosion. Accuracy and volume of fire will be all important.

I do not suggest that long range and high calibre artillery will entirely disappear, but I do consider that long range guns and heavy howitzers will play a very secondary role, far more so than to-day. What I do suggest is that in the future guns will definitely be made for tanks and similar weapons, and will be designed to destroy these machines and not primarily to destroy infantry. The future gun is likely to be of comparatively small calibre, but of high velocity and accuracy of fire. In my opinion two main types are likely to be evolved, a cannon superior to but of the nature of the existing 3 and 6 prs., and a heavy machine gun firing a half to a one-inch bullet. The first will constitute the out-fighing, and the second the in-fighting weapon of the ideal army.

6. The Constant Factors.

Thus far I have examined what I believe to be the more important changes which are to-day influencing military organisation, and will, in my opinion, radically change it. This must not blind us, however, to the fact that certain factors remain constant,

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and are likely to remain so. Of these factors the two most important are human nature and ground. The first seldom manifests in its full form except in war, and is consequently overlooked during peace time; the second is more generally recognised, but its relationship to the means of movement we employ, and the possible tactics resulting are overlooked.

Before the last great war most soldiers were always talking of moral qualities until they had suggested to themselves that battles could be won by *moral* alone. Thus hallucinated they stepped on to the battlefields of 1914 only to discover that even the best trained troops in Europe would seldom face modern rifle and machine fire more than once. Human nature could not stand the fire-power of 1914, and the result was static warfare. To-day small arm fire-power has been multiplied three times, yet military organisation is no more self-protective than it was in 1914. To insist that European or other armies are to-day preparing for a war of movement is, in my opinion, incorrect, they are doing nothing of the sort. What they are preparing for, however unconsciously it may be, is to be surprised by the machine gun as they were surprised twelve years ago. They are preparing for a war of slaughter not for a war of movement, and no nation during the next thirty years is likely to tolerate the shambles of 1914, 1915, 1916 and 1917.

Intimately connected with the moral factor is the factor of ground. Ground is a constant condition, or at least one which changes very slowly. The means of moving over it have in the last hundred years radically changed, and these means may roughly be divided into mechanical and non-mechanical categories, consequently ground also should be divided into two categories, ground over which cross-country machines can move freely, and ground which is unsuitable to them. For brief I will call the first "tank areas" and the second "infantry areas."

It is obvious that armies must be prepared to fight over both these areas,[1] and it is also obvious that unless infantry can move at the same pace as tanks, unity of control and action will be most difficult and frequently impossible, unless the speed of the tank

[1] As the infantry areas will normally cover mountainous country or forest land, present ideas on infantry training and tactics will have to be modified. A skilful light infantry will be required in the future, and not the "heavy" infantry we know to-day.

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forces is restricted. It stands to reason, therefore, that to maintain the maximum mobility, such infantry as are required to co-operate with the mechanical forces must be mechanised, that is to say when not fighting they must be carried in cross-country machines. In tank areas infantry are an incumbrance, and in infantry areas tanks are equally so, and as the nature of the ground fought over cannot be changed, consequently organisation must be adapted to fit it. For example: if a General is confronted by a battle in a tank area, one thing he does not want to do is to detach a tank force to protect his infantry units. The infantry must be so organised and equipped that they are self-protective against tanks, they must in fact, be able to form an anti-tank laager. We thus get back to the question of the field base, which should be organised as a mobile fortress, and which should form part of each fighting formation. It should also be organised in two echelons (a) and (b), so that one may remain loaded up whilst the other is away replenishing its supplies. We see, therefore, that these field bases fulfil two purposes, not only do they supply their formation, but they constitute also havens of refuge for either tanks and infantry when not in use, as well as defended harbours for the assembly of such transport as is not required in the battle itself.

From the above the following requirements are arrived at:—

(i) Three main categories of tanks, each in one or two classes.
(ii) The infantry required to accompany a mechanical army must be carried in cross-country vehicles.
(iii) Each main formation must be organised to include a protective mobile field base (in two echelons).

II. Changes in Organisation.

7. General Tactical Organisation.

Having considered the question of means, I will now turn to the problem of tactical organisation, and see how these means can be set together in a co-operative order.

An organisation must possess not only offensive power but protective power, and these two essentials must be so ordered and related that the mobility of the organisation is in no way impaired. Security demands not only tactical liberty which is gained through

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protected offensive action, but uninterrupted and adequate supply. Hitherto the second of these two requirements has generally acted as a brake on the first, but if the supply services can be rendered self-protective, and can be organised to move as rapidly as the combatant troops, then this difficulty will be largely overcome.

I have already examined the question of bases and of advanced bases, and I have also suggested that each main formation such as a division should include a mobile self-protective field base. The possibility of supplying these field bases from the mobile advanced base, and of securely convoying supplies from the main base to the advanced base, and from this base to the field bases will constitute the administrative order from which offensive action will spring. Without this order strategical and tactical stability will be wanting. Hitherto this order has been tied down to roads and railways; in the future, though these means of communication will continue to play an important part, their limitations will be considerably modified by power to move across country, until possibly cross-country movement will become the most important factor in supply.

Turning now to offensive action, which will depend for its freedom on the integrity not only of road and railway communications but on secure movement over entire areas, the tactical requirements are those I have already enumerated, namely, the enemy must be discovered, his movement must be restricted, and finally he must be smashed. These three operations must spring from a protective organisation which by resisting the enemy's pressure can gain freedom of movement for the troops carrying out these three tactical requirements. By power to resist pressure I do not only mean ability to deal blows, but a strength so ordered that the enemy will either refuse attack, or spend much time in manœuvring before attacking.

The stable base of operations, that is the protective order from which offensive action is developed I will call the trunk of the army. To hold an enemy requires at least two tactical arms. These arms should operate from this trunk which should be in close touch with the administrative field base, so that any large hostile force attempting to attack this base will be met by the full resistance of the trunk. To discover the enemy requires a reconnaissance

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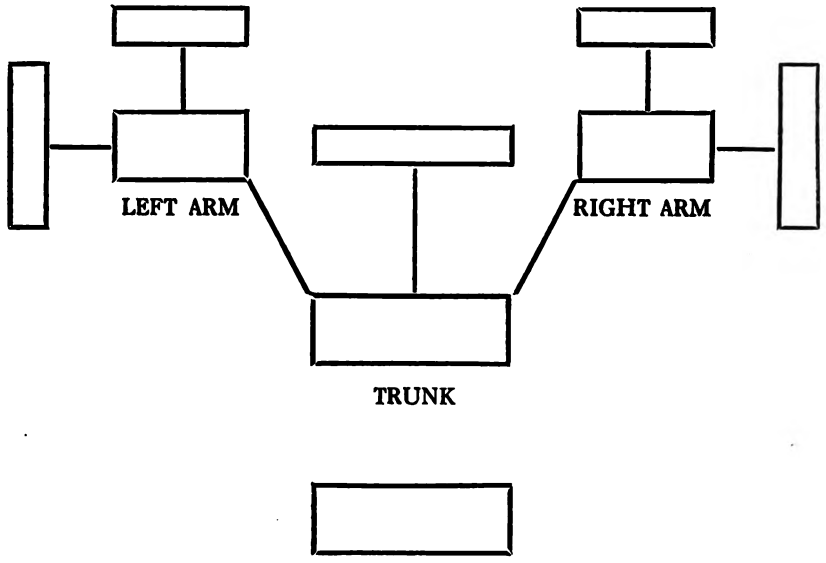
force which obviously must work in the closest co-operation with the trunk and the two arms, and consequently should form part of these organisations. To smash the enemy requires a separate highly mobile force which, when the enemy is held, will strike him in flank or rear. If, however, tactical or geographical conditions prohibit this force manœuvring, then the trunk, protected by its arms must push its way through the enemy and so create an avenue of approach leading towards the enemy's rear services—his vitals. Diagrammatically the tactical organisation suggested may be shown as follows :—



In idea this organisation is a return to the order of battle evolved by Philip of Macedon and Alexander the Great, but possessing more flexibility and endurance for prolonged fighting, as the force which is to deliver the knock-out blow is held in reserve. In the Roman army, which seldom made extensive use of cavalry, the trunk is immensely strong, and is the main instrument of pressure as well as of resistance. In mediæval armies the trunk dwindles into insignificance, and the arms unite and become purely armoured cavalry. In the days of Napoleon a return is made to the classical period, and the French army organisation is largely

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based on the Roman model tempered by extensive use of cavalry to deliver the knock-out blow. Since his day, light and heavy infantry have merged into one arm, and cavalry power has become more and more limited until it has all but disappeared. The influence of these changes on tactical organisation have been radical; armies have lost their mobility and flexibility. The trunk has grown more and more resistant, and less and less able to press an enemy back. The arms have disappeared, and a return has been made to the rigid linear system of the seventeenth century. Light infantry are replaced by cavalry, and infantry are strongly supported by artillery. In fact, by 1914 it was not infantry who prepared the way for cavalry but artillery which prepared the way for infantry, in order to render the infantry assault possible. The assault had in fact replaced the cavalry charge. Then, as the war developed, it was discovered that the assault in its turn had become almost as limited as the charge. It is to this purely linear organisation, namely, a line of guns and a line of riflemen that all armies returned immediately after the war, an organisation as primitive as that of a line of spearmen and a line of bowmen. I have made this digression because it is important to realise how defective existing military organisations are.

As the destruction of the enemy's strength is the aim of battle, so also is the occupation of the enemy's country the aim of war, so that a condition of non-resistance may be established which will permit of political action taking effect. As the occupation of a country is mainly police duty, numbers of men rather than strength of fighting power are required. These men should be organised into a separate force, for if they are added to the field army they must seriously detract from its mobility. Their use is after the battle not during it, in fact on the battlefield they can only prove a serious encumbrance.

I will now chart out the whole of this ideal organisation diagrammatically :—

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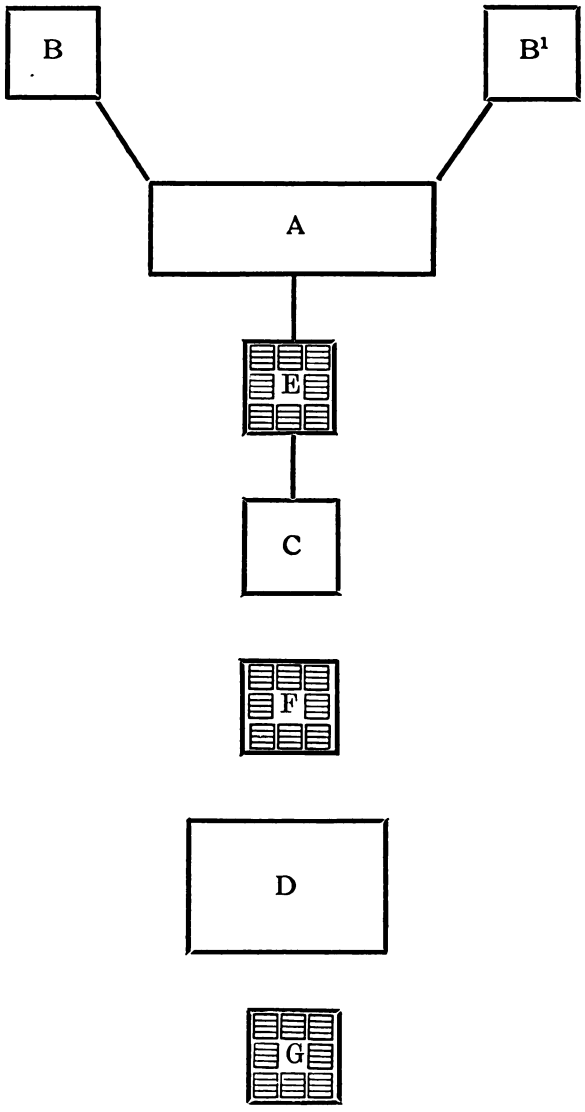

A is the trunk of the field army, and B, B^1 are its two tactical arms, all three possessing their own reconnaissance services. On the outbreak of war, B and B^1 move rapidly forward and search for the enemy, or occupy positions which are of importance to him. Once they discover him, they restrict his movements in order to gain time for A to clinch with him. Once A obtains a firm hold, C moves forward and attacks the enemy in flank or rear; or if the enemy is already broken, pursues. If B and B^1 are driven back,

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A protects them, and if necessary C counter-attacks. Once the enemy's field army is destroyed, D occupies the conquered country. So much for the tactics of this organisation, now as to its supply services.

E is what I have called the field base, or formation laager,[1] it supplies A, B, B^1 and C, and is protected against any operation other than a raid by the close proximity of these forces. It is supplied from the advanced base F which is a mobile fortress; supplies being convoyed from F to E. F is similarly supplied from the main base G, which is a static fortress. D can find security in G until required. Such, in brief, I believe, is the organisation suitable for area warfare. I will now in some detail examine each part of this organisation.

8. The Organisation of Supply.

Accepting the above organisation as a hypothetical model, I will first examine its system of supply, for on it depends to a large extent the freedom of movement of the field army.

To start with the main base—G on the diagram. It must, as I have already said, be static, in fact on its stability will to a considerable extent depend the smooth working of the administrative services which is so essential to the tactical mobility of the field army.

If it is a coastal base, its utility obviously depends on the security of the sea communications connecting it with the home base, if an industrial area, then on protection of certain land communications. These being safeguarded, the problem becomes one of protection against land and air attack. As long as the field army remains undefeated, a heavy attack upon it is a most unlikely contingency, but it must be protected against armoured cars and possibly tank raids. It should be surrounded, therefore, by an anti-tank moat and protected by mine-fields. It should also possess a small mobile column, which can make sorties against any raider.

Its security against air attack is its main protective problem. It must be equipped with the most scientifically organised ground defences, however static and delicate may be their nature, and it

[1] For simplicity I have shown it as one unit. Normally one of the echelons (a) or (b) of the field bases will be assembled at a central refilling point, which in the diagram may be considered to be at E.

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must possess one or more aerodromes, a series of out-lying landing grounds, and a strong force of aircraft.

Once its protection is guaranteed, the next problem is the safe replenishment of the advanced bases. Though these organisations are mobile and can move across country, it must not be supposed that railways and roads will not be used. They will be used to their full extent, and their vital points—bridges, junctions, tunnels, etc.—will have to be protected. But to supplement their powers, cross-country supply columns must be provided, and these I consider should be moved by powerful tractors hauling from 25 to 100 tons across country in tracked supply vehicles. These columns must be convoyed by tanks of the destroyer class.

The advanced base, as I have already stated, must be mobile, it must be able to shift its position, for though, when possible, it will occupy a road or rail centre, it will not always be able to do so, since in area warfare it may at any moment be attacked from any direction. In order that its mobility may be of a high order, its supplies and its workshops, etc., must be able to move at short notice. This means that the minimum of dumping will take place, the bulk of the supplies and workshops must therefore be kept on tracks.

Its protection must be more mobile than the main base. Though trenches may be dug and mine-fields laid, its chief land defence must depend on power to hit out hard, as well as to guard. Its air defence must be equally mobile, consequently it must possess its own force of aeroplanes, and as its gun defence cannot be so delicate and complex as that of the coastal base, I consider that a self-propelled gun equipped with special sights will be the most suitable weapon.

The supplies it receives from the main base will be kept on tracks, and when required by the field army will be sent to it either by road or across country.

I now come to E, the field base, which receives supplies from F, and distributes them to the formations. It is an integral part of the field army which largely protects it—its local protection must be provided by itself.

When the whole army is assembled and is in close contact, the supply of its parts should provide no great difficulty, nor should

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the difficulty be great once the enemy is defeated, for defeat precludes tactical operations other than rearguard and flankguard raids. The main difficulties of supply will I think occur before contact is gained, and whilst the army is manœuvring for a clinch. When the wings B and B^1 are searching for the enemy, or when at a distance from A and C they are attempting to hold him, or restrict his power of manœuvre, the endurance of their pressure and resistance will depend on their maintenance. How long they can live on their own fat will depend on the size of their integral supply units. If a high mobility is to be maintained these must be small, and the smaller they are the more frequently must they be replenished. This replenishment should, I consider, be done not by comparatively slow-moving cross-country trains as suggested for the supply of F and E, but by more rapidly moving cross-country lorries, these again will have to be escorted.

To summarise what I have now written. The whole supply organisation springs from the static main base G. From G to F, the advanced base, road, rail and cross-country trains will be used, and from F to E cross-country trains will be mainly depended on. From E to the formations themselves cross-country lorries will be the transport used. All columns will normally have to be convoyed by fighting machines, and the types which suggest themselves as most suitable for this purpose are the scout and destroyer classes.

9. The Organisation of the Heavy Divisions.

The trunk A must possess great resisting power so as to enable the wings B and B^1 to maintain their mobility. As normally great battles take place in moderately open country, this trunk in the main must be a mechanical force; but as it may at times be called upon to fight in infantry areas, it must also include infantry. I will suppose that it is composed of heavy divisions each of two brigades.

A heavy brigade must be able to carry out its own reconnaissance, therefore I will allot to it a battalion of scout tanks, or a battalion of armoured cars.[1] For its resisting power I will allot to it one battalion of assault machines. These are its capital ships,

[1] I am of opinion that eventually the present armoured car will be replaced by a tracked or semi-tracked machine.

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and as they are never likely to exist in great numbers, they should be protected by two battalions of destroyer tanks. To increase the resisting power of this force I will allot to the division two brigades of self-propelled guns. Such I visualise will be its main mechanical arms.

To assist it in reconnaissance, and to protect it from air attack, the division will require at least two squadrons of aeroplanes. Further if cavalry can be so equipped that they can average fifty miles a day for three or four days on end, they will still prove not only useful for local reconnaissance, but most valuable for purposes of communication, traffic control, and police work.

As the infantry will be required to move with the heavy divisions they must be carried in cross-country machines. In open country they are useless, and in mountainous country the tanks are almost equally so; but if a new type of soldier namely, a tank-infantryman[1] were to be created, then this difficulty would in part be overcome. What I suggest is that every tank (and armoured car) soldier should not only be trained as a tank driver and gunner but also as a light infantryman. If, for example, a tank battalion consists of 40 tanks, and each machine requires a crew of five men, then I suggest that each machine be allotted four crews. One of these crews would be in the machine, and three in cross-country vehicles, All the men would be trained to fight in a tank, or to fight as light infantry. The maximum fighting power would therefore be 40 tanks and 600 light infantry, or, if the tanks cannot be used, then about 700 light infantry, as about 100 would be required as "tank-holders." Not only would this organisation enable both types of ground to be fought over by the same soldier, but would provide the tanks with three reserve crews apiece, a most important reserve, since in war, though it should not be difficult to replace machines, it will always be difficult to train a reserve of tank drivers and gunners.

The strength of a heavy brigade may very roughly be calculated as follows:—

[1] This was done in our own army during the war, for all tank crews were trained to fight as Lewis Gunners in the open.

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Units.	No. of Machines.	Strength of each crew.	Strength of crews.	Strength of spare crews.	Unit Administrative personnel.	Cross-country vehicles.	Supply vehicles.
1 Bn. Scout Ts.	40	3	120	600	180	52	15
1 Bn. Assault Ts.	40	7	280	560	210	52	20
2 Bns. Destroyer Ts.	80	5	400	1200	400	108	30
	160	—	800	2360	790	212	65

The totals for the tank-infantry portion are therefore 160 tanks, 277 cross-country vehicles, and 3950 officers and men, or 7900 for the division. Adding 1100 officers and men for the two brigades of artillery, the cavalry regiment and the two squadrons of aeroplanes we get a total of 9000, which probably will rise to about 10,000 when sappers, signallers and special troops for the local protection of the divisional field base are added. Add to this forty per cent. for administrative services and convoy troops, and the total personnel strength of a heavy division will be about 14,000 officers and men.

The heavy division as we see is divided into two categories of troops, those who can fight in tank areas, and those who can fight in infantry areas. Whichever area is met with the troops not required to fight in it will be relegated to the field base E, and when both areas are simultaneously met with this base will not only protect itself but will be protected by force C until this force is required to carry out the decisive attack on the enemy's flanks or rear.

10. The Organisation of the Light Divisions.

I will now turn from the composition of the heavy division to that of the light division, one or more of which should form the tactical arms, or wings of the central trunk. Its mobility should be considerably higher than that of the heavy divisions, and this mobility should be gained not so much by building faster machines, but by so organising this formation that it possesses little impedi-

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menta. To gain this mobility the organisation of the light division must be entirely mechanical. Cavalry can form no part of this organisation during the highly mobile phases of a war, and if, when the slower phases set in, it is considered that cavalry will prove useful, then I am of opinion that they should be held in reserve at D or F until these phases develop.

Without infantry these wings will not be able to operate freely through infantry areas. This limitation must be accepted, for to encumber this formation with a large number of cross-country vehicles would detract from its mobility. If these areas are met with and are occupied by the enemy, then the light divisions must either hold the enemy until the heavy division can approach, or else through their high mobility they must circumvent these areas and cut their garrisons off from their base.

Each light division I suggest should consist of two brigades, each consisting of:—

Units.	No. of Machines.	Strength of each crew.	Strength of crews.	Strength of spare crews.	Unit Administrative personnel.	Cross-country vehicles.	Supply vehicles.
1 Bn. Scout Ts.	40	3	120	120	60	12	10
3 Bns. Destroyer Ts.	120	5	600	600	300	60	45
	160	—	720	720	360	72	55

This gives a total of 160 tanks, 127 cross-country vehicles and 1800 officers and men. For the combatant part of the light division this number must be doubled—3600—and brought up to 4000 to include sappers and signallers. Adding to this forty per cent. for administrative services we obtain the grand total of 5600 officers and men for each light division.

The spare crews should not, so I consider, be trained to fight as light infantry, but in place to protect the administrative units against tank and infantry attack.

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11. The organisation of the Pursuit Divisions.

The force destined to deliver the knock-out blow should consist of one or more pursuit divisions, each consisting of two brigades, each of three battalions of pursuit machines. No other machines should be allotted to these brigades otherwise mobility will suffer, therefore the reconnaissance requirements of a pursuit brigade should be carried out by aircraft. The establishment of a pursuit battalion might be as follows :—

Unit.	No. of machines.	Strength of each crew.	Strength of crews.	Strength of spare crews.	Unit Administrative personnel.	Cross-country vehicles.	Supply vehicles.
1 Bn. Pursuit Ts.	40	7	280	280	140	28	20

For each brigade this would make 120 tanks, 144 cross-country vehicles, and 2100 officers and men, or for a pursuit division 4200 officers and men, or with sappers and signallers about 5000.

When in action, it is important that the six pursuit battalions of these divisions should be entirely freed from the responsibility of protecting their administrative services, yet it is equally important that these should be protected. I suggest, therefore, that each pursuit division be allotted one destroyer battalion for this purpose, strength in personnel 500, and a chemical warfare and bridging battalion, which will bring the combatant strength of the division up to 6000. Add to this forty per cent. for administrative personnel, and the total strength will be 8400.

12. The Organisation of the Army of Occupation.

Thus far I have only considered that part of an army which can destroy the enemy's strength, and break down military opposition. But victory in itself is only a means towards an end, the end being political action. To guarantee that this action may become effective, it is not only necessary to destroy the enemy's military strength, but to occupy his country, and establish a condition of tranquillity which will enable political action to take effect. In recent times this occupation has been carried out by the fighting

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troops themselves, since numbers of men were required for this purpose, and infantry were as cheap as a special police force. When armies become mechanised, this condition will change. First, mechanical armies will be comparatively small, secondly they will not be well suited for this work, and thirdly it will be extravagant to use them for it. I am of opinion, therefore, that in wars which demand occupation, as most wars do, for occupation of an area to a large degree guarantees its security as a tactical base of operations, the mechanical forces will have to be followed by a police force. This force I am of opinion will be largely composed of the arms we know to-day, namely, cavalry, artillery and infantry. Certain modification will undoubtedly be introduced, such as bus columns and anti-tank units; but changes are unlikely to be radical since occupation and police work demand not so much the coercion of the enemy's civil population as their control. This control can best be gained by freely moving amongst them.

This army of occupation may also be called upon to carry out another duty, namely, the reinforcement of the infantry of the mechanical army should extensive mountain warfare or forest-fighting become necessary.

13. The Ideal Army in 1946.

Though it is impossible to visualise in detail what an army will look like twenty years hence, it is possible, as I have attempted to do, to consider the defects of existing army organisation; to examine existing tendencies, and by projecting these into the future to build up a hypothetical model. If this model is based on sound principles, the probabilities are that though the armies of 1946 will in detail largely differ from the ideal, in principle the differences will not be radical.[1] We must remember that unless we have clearly in our heads an idea of what we want, not only must progress be extremely slow, but its cost extravagantly high. Before painting a picture an artist must have in his head an idea of what he wants to paint. He converts this idea into a sketch, and eventually elaborates this sketch into a picture. If we are to work on rational lines our process must be identical.

[1] Assuming always that they are willing to change.

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I have now outlined a sketch, rough though it be. I have started by proving, at least I hope I have, that to-day we are confronted by a new military conception, namely, area warfare, consequently existing tactics must be changed to fit it, and consequently military organisation must be changed in order to express these tactics.

In war the essential is to defeat the enemy with the least possible all round loss. In peace time the essential is efficiency. Sometimes efficiency has demanded a small army, sometimes a large. In the cavalry cycle of war (400—1400 A.D.) armies were frequently microscopic in size, because no nation could recruit or pay for thousands of armoured cavalry. During the infantry cycle (1450—to-day) armies grew and grew in size until numbers swamped efficiency, and in the last war, we see a return to the horde armies of ancient Assyria and Persia.

To-day, in the artillery cycle, we are going, so I believe, to return to efficiency and to comparatively small armies, and for very similar economic reasons as those which governed the cavalry cycle. Directly we can free our minds from the spell of numerical superiority, that God marches with the big battalions, shall we realise this. The army of the future will follow in the footsteps of the navy of to-day. Once a maritime nation could build scores and hundreds of galleys; to-day many seafaring powers cannot afford half a dozen capital ships, even in the Great War we only possessed between twenty and thirty.[1]

My conception of the ideal army of 1946 is as follows:—

(i) Two heavy divisions, strength approximately 28,000 officers and men.

(ii) Two light divisions, strength approximately 12,000 officers and men.

(iii) Two pursuit divisions, strength approximately 17,000 officers and men.

In round numbers the strength of such an army will be 2000 fighting machines[2] and 60,000 all ranks. A microscopic force

[1] Galley fighting was sea "infantry" warfare; capital ship fighting is sea "artillery" warfare. To-day, the same process of change is at work in armies as formerly was the case in navies.

[2] The cost of such a force may perplex some readers. It is not however prohibitive. If *on an average* each machine costs £10,000 (a high figure), the capital cost will be £20,000,000; and if the life of a machine is reckoned at ten years, the yearly production cost will be £2,000,000.

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when compared to the horde armies of 1914-1918. Yet, though during the last year of the war we used up as many tanks as the number I have just quoted, can it be doubted that if the *organised* force of my sketch had existed, we could not have decimated these hordes as surely as Alexander decimated the Persians at Issus and at Arbela?

Finally, in my opinion, the artillery, or mechanical, cycle of war will reintroduce the highly professional army, and conscription will be relegated to the troops of the second line, the militia which will occupy the enemy's country after his mechanical forces have been defeated, driven back, or destroyed.

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YPRES.

The Story of a Thousand Years[1]

By Major A. F. Becke, late R.F.A.

Part I. The first five centuries, 900—1400.

(With 2 plans.)

THE story of Ypres is a romance, and a romance, too, that not only covers ten centuries of time, but also enshrines a pageant of a city's life: its steady, healthy growth, its achievement of municipal administration, its embellishment with an unrivalled architectural splendour, its protection by renowned fortifications, and its decay. But while its commerce flourished and its industries prospered, the even flow of its life was often disturbed by civil strife, religious zeal and persecutions, by great battles and by famous sieges, until at long last the ancient city was blasted with a three years tempest of iron.

Its mouldering walls and shell-scarred bastions now enclosed the shattered ruins of its rich and splendid buildings, its noble *Halles*,[2] and venerable churches; and all that remained of its towering belfry was a mere splintered fragment pointing dumbly to the sky, ghostly relics of crumbling greatness.

This in brief, is the story that is to be unfolded of the bygone pride and ornament of Western Flanders. Few places have grown so great and beautiful, and fewer still have fallen so low as Ypres.

Note.—I particularly wish to express my gratitude to Major A. H. Thomas, late, The Lancashire Fusiliers, and now Clerk of the Records of the City of London, for having very kindly read this article for me and for making many valuable suggestions.

[1] The chief authority for this narrative, as well as for the two plans, is *L'Histoire militaire de la ville d'Ypres* by J. J. J. Vereecke. This book, with its accompanying atlas of 37 maps and plates, was published at Ghent in 1858, and is based on old printed accounts and on original documents in the archives then preserved at Ypres. The book and its atlas are rare and difficult to obtain, and even the British Museum library does not appear to possess a copy. At the end of the book are given the names of the 150 original subscribers to the work, who took between them 350 copies.

[2] The Cloth Hall of the British maps.

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Ypres was the former capital of Western Flanders, a territory composed of the overlordships [*Châtellenies*] of Ypres, Bailleul, Cassel, Bourbourg (on either side of the river Aa from Watten to Gravelines), Bergues St. Winoc (from the Upper Yser past Bergues to Dunkirk), and Furnes. In ancient times the old city was always regarded as one of the main bulwarks in the defence of the country, for which reason it was strongly fortified and in consequence sustained numerous sieges. Perhaps no town has undergone more changes than Ypres. At one time small and insignificant, it gradually grew rich and powerful, and became well, and in the end even elaborately, fortified. Then conditions changed and its works were allowed to fall into decay and ruin; but this was not the end, for these ravages of time were followed by restoration, and Ypres once more assumed its position as an important fortress, until in 1852 the place was declared obsolete and finally dismantled.[1] Its trade had long since passed away, and for years after its degradation the place merely existed, dreaming of its past greatness, when in 1914 there came a sudden final awakening, followed as swiftly by ruin absolute and complete.[2]

The story of Ypres, therefore, is well worth telling for itself, but when we recall that since the earliest times our own history on many occasions has been associated with the place, then the tale is indeed worth recounting.

Early times.

In Roman times the towns then existing in the vicinity of what afterwards became the site of Ypres, were Wervicq *(Viraviacum)* on the Lys, lying to the south-eastward, and Cassel *(Castellum Morinorum)*[3] to the westward. One of the six Roman roads that radiated from Bavai *(Bagacum)* ran via Tournai *(Tornacum)* and Wervicq to Cassel, passing midway between the present sites of the ruins of Ypres and Messines.[4] From Cassel this road ran on to

[1] At the same time the fortifications at Menin, Ath, Philipeville, and Mariembourg were also dispensed with.

[2] With the reborn Ypres this narrative naturally has nothing to do.

[3] *Castellum Menapiorum* was apparently the Roman name for Kessel (on the Moselle).

[4] Another of these Roman roads starting from Bavai, was the Brunhild Way that ran past the battlefields of Fleurus (1690) and of Ligny (1815). This road went on to *Colonia Agrippina* (Cologne).

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Boulogne *(Gesoriacum)*. But in Roman times, excepting for this one route, the district was without any military communications and was covered with dense forests and impassable marshes.

It is extremely difficult to disentangle from the accretion of legends exactly what was the genesis of the ancient city of Ypres. It seems probable, however, that the first authentic building on this site was erected during the first decade of the Xth Century, when, in 902, Baldwin the Bold, the second Count of Flanders,[1] built a *château* on the Yperlée. This house was placed on the northern end of a small island, and communicated with the left bank by a bridge that spanned the western branch of the stream. In plan the *château* was triangular, and was flanked at each corner by a tower, whence it was named suitably enough *Château à trois tours.*[2] Naturally it was not long before retainers and others came and settled down under the protection of their Count and built themselves dwellings on the island in the Yperlée. This was probably the real origin of the town of Ypres.[3]

The First Defences.

Soon the population grew, and the buildings then spread from the island to the right bank of the eastern branch of the river. The ground here had to be cleared, for at that epoch it was covered with trees, and on both banks of the Yperlée to the southward lay extensive swamps. This growing collection of houses on the mainland lay open and defenceless and invited a raid; consequently in 920, to cover the village that had sprung up, Arnulf, Count of Flanders (son of Baldwin), had Ypres[4] put in a state of defence for the first time.

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[1] Baldwin the IInd married a daughter of Alfred the Great of England. He died in 918.

[2] It must not be confused with the modern house, the *Château des Trois Tours*, that was situated about half a mile to the west of Brielen and 2¼ miles north-west of the site of Baldwin's original building.

During the Battles of Ypres, 1915, Canadian Divisional Headquarters used the *Château des Trois Tours.*

[3] In 1914 the site of the ancient *Château à trois tours* was inside the town of Ypres, and lay about eighty yards to the west of St. Martin's Cathedral. Although in later times the Yperlée ran underground within the city itself (like the *Rivière des Layes* at Armentières), yet even as late as the XVIIth Century it ran through the town, passing to the westward of the *Halles* and St. Martin's.

[4] The Town on the Yperlée.

Ancient maps show that the old course of the Yperlée was as follows:— rising near Wulverghem it ran past Voormezeele, Ypres, and Knocke where it joined the Yser, and the joint stream then flowed on past Dixmude, as it does now, to the sea near Nieuport.

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Arnulf caused the place to be enclosed by an earthen rampart, or parapet, with a ditch beyond it,[1] which covered the northern, eastern, and southern sides, whilst the western flank was secured by the Yperlée itself and the *château*. The defencible enceinte was pierced by three gates: by the north gate, leading to Thourout, by the south gate, leading to Messines, whilst the original passage from the *château* across to the western bank of the river went by the name of the Meadow Gate.

But still the place grew, and in 958 Count Baldwin the IIIrd was forced to allow it to expand on to the main left bank of the river. As an immediate result of this the *Château à trois tours* became enclosed within the town itself and thus ceased to play any useful part in the outer defences of Ypres. It was not until about 965 that this expansion was completed, and then the shape of the town was entirely changed, and it now approximated in contour to what it was in August 1914 (see Plan 1).

The Gateways.

The number of gates had by now been increased to six. On the north face were three: Boesinghe, Dixmude (still in existence in 1914), and Thourout. The Antwerp gate was on the eastern side, the Messines Gate (in later times called the Lille Gate) was on the southern, and on the western was the Temple Gate. Later on the last-named was replaced by the gate through which the road to Bailleul leaves Ypres.

The Porte d'Anvers, or Antwerp Gate, known to so many officers and men under its modern name of Menin Gate, requires especial mention. The original name of this ancient sally-port was probably Hangoart-poort.[2] But the pronunciation of this hideous

[1] Ypres was not surrounded by walls at this time. Even during the famous siege of 1383 the defence was still an earthen rampart, and the only masonry in it was that used for the construction of the gates with which the parapet was pierced.

Only three Flemish fortresses in the Xth Century were defended by stone walls. Baldwin *Bras de Fer*, the first Count of Flanders, had thus strengthened Bruges (covering the approach from the sea), Ghent (on the Lorraine frontier, covering the passages across the Schelde), and Arras (on the southern side, facing France).

Baldwin the 1st had married a daughter of Charles the Bold (King of Neustria and Burgundy), and from him held Flanders as an hereditary fief.

[2] The origin of Hangoart-poort is uncertain. In the XIIIth Century there was then domiciled at Lille a noble Flemish family called Hangouart. Possibly in earlier times an ancestor had owned a house in Ypres near this gate, and belonging to a family of distinction, he gave his name to the gate. However this may be, the road outside the gate was called the Hangoart-Straat (but this latter was not coincident with the modern Menin Road, but lay just to the southward of its alignment).

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name was too difficult, and in the Yprois dialect it was soon corrupted to the easier form of Hanwerpoort. Possible Porte d'Anvers was derived from this debased form, and by 1640 it was in common use. The name Menin Gate does not appear on maps before 1815.

In 1075 Robert the Frisian, who had by then become undisputed Count of Flanders, built in Ypres the Church of St. Peter, near the Messines Gate.[1] This was one of the thirty churches that Robert had vowed to build or restore as a thank-offering for his victory over Philip the 1st, King of France, on the 22nd February 1071 near Cassel.

The First Siege.

Ypres was soon to receive its *baptême de feu*, for in 1127 it sustained its first serious siege. On the 25th May Louis the VIth, King of France, invested the place. His troops repulsed a sortie that was made by the garrison in the direction of Vlamertinghe, but otherwise little success was achieved by the besieging force. Treachery, however, brought about the fall of the town, for local sympathisers with the French sold the South, or Messines, Gate and an entry was effected at this point. Meanwhile Louis pressed home an attack and the place fell. But even then for some time the Castellan [*châtelain*] of Ypres, William of Ypres (or Loo),[2] and three hundred of the garrison stoutly maintained themselves on the northern ramparts near the Thourout Gate, until finally forced back from this position they were eventually rounded up and secured. The city was then at once given over to pillage and the inhabitants were disarmed.

Louis after a short time released the Castellan, and William of Ypres then crossed over to England and fought for King Stephen, who rewarded him with revenues drawn from the crown lands in Kent.[3] William finally returned to Flanders and died at Loo[4] in 1163.

[1] By 1914 the original church had been largely rebuilt.

[2] William of Ypres, son of the Count of Ypres (a younger son of Robert of Flanders) had claimed the Flemish succession. Another candidate, however, had been put forward by Louis of France who supported his nominee with his army, and as narrated above captured William at Ypres.

[3] Whilst Warden of Rye, William built the tower now known as the Ypres Tower.

[4] Ten miles north-north-west of Ypres.

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Plan 1.

Ypres itself was still expanding and it continued to do so on the western bank of the Yperlée. More gates had to be pierced in the new enceinte. On the western face was constructed the appropriately named Butter Gate which led very suitably to the Boter Plas. At the north-western angle was the new Elverdinghe gate, and a postern, the Steendampoort, was pierced in the northern side.

At the same time the defences were overhauled and improved: the moat was deepened, the earthen rampart was strengthened, and wooden towers were also placed on it, probably not with the idea of providing flanking defence, but to assist in limiting and controlling any lodgment that might be effected by an assailant on the banquette. Each tower, too, was a separate fort to be carried only after a costly escalade, unless it could be burned by the assailant. At the same time thorn hedges were planted on the ramparts, and thus came into existence the celebrated *Tuinen*,[1] which covered and enclosed the place for so many years.

Meanwhile in 1168, Count Philip of Alsace began the erection of a town house, that was afterwards used as their official residence by several Counts of Flanders. The site of the new building, called locally the Count's Hall,[2] was on a small islet, and it was surrounded by large wet ditches fed by the waters of the Yperlée. Like all buildings of the period it had towers and the battlements were crenellated, though it was not intended to form part of the real defences of the place. During the XVth and XVIth centuries it became the seat of administration for the overlordship of Ypres, until in about 1550 a new court was built for this purpose in the Grande Place. The Count's Hall finally degenerated into a military prison, its ditches were gradually filled in, and by 1838 all traces of this venerable building had vanished. Its erection, however, had one important result—the old *Château à trois tours* was finally abandoned by the Counts, and, falling into decay, this earliest Yprois building gradually disappeared and its site was built over.[3]

[1] Enclosures, gardens, the French equivalent probably would be *clôtures*.

[2] *Zael hof*. Its site was about 250 yards to the west of St. Peter's Church.

[3] This appears to have occurred before the middle of the XIIIth century.

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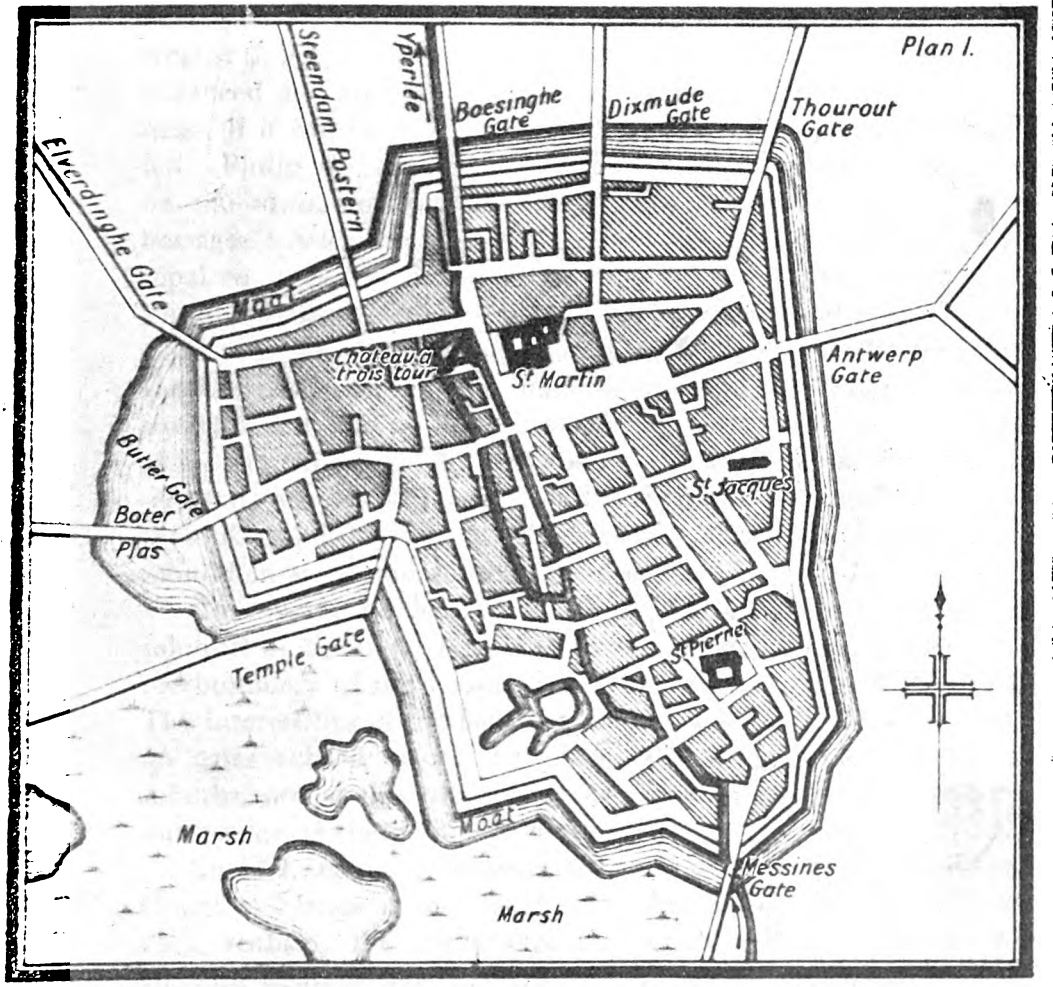
Issued with the "Journal of the Royal Artillery," Vol. LIII. No. 3. [To face page 372.

YPRES
(ABOUT THE MIDDLE OF THE XIITH CENTURY).



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THE SECOND SIEGE.

In 1179 the overlordship of Ypres was precisely defined and thirty-three parishes were placed under the Castellan. This arrangement persisted until the overlordship was abolished in 1794, at the time of the French occupation of the country.

Ypres itself became embroiled in the quarrel between Count Ferdinand of Portugal and his uncle the French King, Philip Augustus, and the latter having seized St. Omer, Aire, and Cassel, advanced and surprised the town on the 8th March 1214. The siege, if it can be so called, lasted only a few days and the place fell. Philip Augustus disarmed the people, imposed a heavy fine on the town, and sent the principal inhabitants into France as hostages. After the French evacuated the place the ramparts were repaired and the defences once more thoroughly overhauled. Philip Augustus in the peace that he imposed included the conditions that the defences of Valenciennes, Ypres, Audenarde, and Cassel were to be levelled, no other Flemish fortresses should be strengthened, and no new ones constructed without the permission of the French King. But so far as Ypres was concerned this proviso seems to have been ignored. In 1229, however, Louis the IXth, then King of France, gave permission to Count Ferdinand to rebuild in stone the gates of his towns.

In the second half of the XIIIth century the outskirts (or suburbs) of Ypres were marked by ten stones[1] so as to make clear the boundary of the jurisdiction of the chief magistrate of Ypres. The interest lies in the fact that the records show that at this time no gates existed where the roads crossed the extremity of the suburbs, nor at this time were any defences thrown up along the outer edge of the delimited area.

In 1297 raged the unfortunate war between Guy of Dampierre, Count of Flanders, and the French king, Philip the Fair. Count Guy, realising the importance of friendly relations between the Flemish weavers and England, the great wool-producing country, had allied himself with Edward the 1st. Philip retaliated by invading Flanders; and after reducing Lille, which offered a stubborn resistance, he occupied Furnes, Bergues St. Winoc, and

[1] No. 2 stone stood to the south of the town, on the road to Kemmel close to the inn called Withuis (white house) shown on the British maps of the Ypres salient.

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Cassel, and laid siege to Ypres. Once again the town fell, and it was pillaged and part of it burnt. This invasion was followed by a French occupation of Flanders. In 1302, however, the Flemings rose against their French oppressors, and Guy of Namur retook Ypres, when the fortifications of the city were at once repaired.

The Battle of the Golden Spurs,[1] and the formation of the Society of St. Sebastian.

In July of the same year, in the valley of the Lys under the walls of Courtrai, the Flemish infantry under Guy, occupying a well-selected position, routed the French army under Count Robert of Artois. Count Robert had with him 7,000 of the chivalry of Picardy, Normandy, Artois, and Lorraine. The Count, holding his enemy in contempt, made an ill-judged effort to find a short cut to victory by pushing forward his heavy cavalry in a downpour of rain over most unsuitable ground. No doubt here his frame of mind and contempt for his foe were represented by an aphorism that he once uttered: "one hundred mounted men-at-arms are worth a thousand infantry." At this epoch under suitable conditions this was probably true enough, but at Courtrai the ground, natural obstacles, and the weather were all against the employment of heavy mailed cavalry, and the cross-bow and pike in the hands of sturdy, well-placed infantry gained a hard-fought day.

The Yprois, after ensuring adequate protection for their own city, had been able to send to the Flemish army a contingent of 1200 men—500 being footmen dressed in red, and 700 crossbowmen in black. But this detachment was not engaged in the actual battle, being used to garrison Courtrai and to invest the keep, which was still occupied by the enemy, and to neutralise its garrison. While the battle was raging the Yprois drove back a sortie that was attempted with the view of making a diversion. But handled as the French Army was only a miracle could have brought about a French victory on that day. Two days later the Keep surrendered. To commemorate the Flemish victory at Courtrai the Yprois in 1303 founded a society of archers of St. Sebastian. This ancient

[1] Known as the battle of the Golden Spurs, from the fact that many golden spurs (probably about 700, but some writers even say 4,000) hacked from the heels of the dead French Knights and Nobles, were afterwards hung up in Courtrai Cathedral. The Count of Artois himself was slain in the battle.

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society was still flourishing in the middle of the XIXth century, and thus kept green the memory of a great day.

In the further fighting that took place during this war a contingent from Ypres, 800 strong, took part in April 1303 in the battle of Arques, near St. Omer, which resulted in a defeat for the Flemish. The Yprois seized and burned the *château* of Arques, but pushing on they became heavily engaged and lost 600 men. When peace was concluded after the battle, the 200 survivors founded the society of Ste. Barbe Crossbowmen. This society lasted until the last decade of the XVIIIth century.

After the Flemish defeat at Arques popular feeling was inflamed against that section of the community who were known as Leliaerts, or adherents of the Lily, and in November the Yprois rose and killed 9 sheriffs, 4 councillors, and 8 principal inhabitants who were suspected of belonging to the French faction. Once more in the treaty of peace it was stipulated that the Ypres fortifications should be razed, but this decree was not carried out.

In the rebellion of 1324 Ypres and Ghent stood firm. But the former was besieged by the insurgents, and as many of the inhabitants sympathized with the rebels the resistance was weakened and the place surrendered on terms.

The construction of the Outer Defence Line.

In 1325, after the capitulation, the rebel leader, Nicholas Zannekin of Furnes, considerably modified the fortifications of Ypres. He had the old ramparts pulled down and caused parts of the moat to be filled in. He then constructed a new suburban defence line which practically coincided with the line that had been marked along the extremity of the suburbs of the city nearly half a century before. Along this extended line an earthen rampart was thrown up and a double ditch was excavated. This was a tremendous piece of work, for the defencible perimeter was immediately increased from 4500 yards to about 16,000 yards. Nine passages or gates were pierced in the new *enceinte*, eight of them bearing the same names as the old gateways of the XIIth century, whilst the new one, between the Messines and Hangoart gates, was called the Comines Gate.[1] The Steendam postern had

[1] The Comines Gate disappeared about 1395 when the outer line of defence was abandoned and the line drawn back again to the town itself.

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no outlet through the suburban defence line. It took no less than four years to throw up this prodigious rampart and to excavate the double ditch,[1] and the work was only just completed in 1328 when the King of France made one of his periodical assaults on Flanders.[2]

King Philip moved slowly to Cassel, where he encountered and overthrew the Flemish forces and then advanced towards Ypres. The inhabitants very wisely went to meet the king at Vlamertinghe, offered him the keys of the city, and made their submission. This saved the town, but Philip entered Ypres, made the inhabitants pile their arms on the Grande Place, and demanded that the great alarm bell in the belfry of the *Halles*[3] should be handed over, and the town was later ordered to pay a fine of twenty-four thousand pounds. The country being subdued, the King of France and his army withdrew from Flanders, leaving the weak Count Louis of Nevers[4] to govern and settle the country.

In accordance with previous precedent, Philip ordered that Zannekin's new suburban defence line around Ypres should be demolished, but to be quite in accord with precedent the Yprois succeeded in maintaining a policy of masterly inactivity, so far as this demolition was concerned. Then in January 1333 the king gave authority to the people to rebuild the close defences of the town—the old earthen rampart and ditch encircling the place itself and pierced by its old stone gateways, which Zannekin had done away with. Thus from this period, until after the famous siege in 1383, Ypres was surrounded by two defensive lines—the outer, or suburban, and the inner, or urban line.

For a time internecine warfare raged in Flanders, Ypres and Poperinghe came to blows, Vlamertinghe was burned during the

[1] The ditches were separated by a berm, or dyke, of earth on which a palisade was erected. This obstacle was looked on at this time as almost impassable, and it was essential in this case, since the defence of such a lengthy line must have taxed the garrison severely.

[2] Around the whole defencible perimeter and running at the foot of the interior slope of the rampart was a road, called the *Ommeloopstraat* (or Round Way). Traces of it can still be found, notably that stretch of road that skirts the western edge of Zillebeke Lake (only dug in 1295).

[3] The Belfry, built in 1201, was the oldest part of the buildings of the *Halles*. The main buildings, with a facade measuring more than 150 yards in length, were completed in 1304.

[4] Count Louis was killed at Crécy (1346) fighting on the French side.

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quarrel, and Poperinghe suffered severely before mutual goodwill was restored.[1]

But there are nobler deeds to record than civil quarrels. At the naval battle of Sluys, between the English and French, a small Flemish squadron assisted in the crushing victory gained by the English fleet, and on the Flemish ships were 700 men from Ypres under the command of Maurice Ramault. In this battle, fought off the mouth of the Schelde, the naval supremacy that had been gained for France by Philip the Fair was lost by Philip of Valois when his anchored ships were destroyed by a more ably led and quicker foe, and the command of the narrow seas passed into English hands. Ramault and his men, to perpetuate their share in the victory, on their return from Sluys formed the Company of St. Michael.[2]

English Troops Garrison Ypres.

Between July 1343 and January 1346 English troops were on garrison duty in Ypres, placed there by Jacob van Artevelde, who had made an alliance with Edward the IIIrd. Feeling that the presence of the English soldiers secured the safety of their town from possible reprisals, the Yprois, jealous of their weaving rights, carried out raids against Poperinghe, Langemarck, Zonnebeke, and Reninghelst. These armed forays were bitterly fought, but the Yprois who could afford to muster at full strength were successful on each occasion, and they managed to burn houses in which the weaving trade was carried out and to commit a number of excesses. Thus was established the first connection of an English garrison with the city of Ypres. These troops were removed from Ypres shortly after Artevelde's assassination at Ghent. In the Great War the safety of the place for four long years was watched over by English troops, and this released the Belgian Army, not to make raids on its own countrymen, but to withstand successfully the onslaught of a powerful foe.

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[1] The origin of these disputes was the desire of the Yprois to suppress weaving in the neighbouring places. Ypres also attempted to standardize cloth, which was resisted by the other towns.

[2] This society was only dissolved in 1794, at the time of the French occupation.

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The Battle of Houtkerque.

In the year 1347, whilst Edward the IIIrd was besieging Calais, Philip of Valois despatched a French force under the Duke of Normandy to make a diversion by invading Flanders. Cassel successfully resisted the invaders, and the French then marched on Ypres. The city at this time had probably reached the zenith of its greatness. It was covered by two fortified lines, had a numerous and wealthy population numbering about 80,000 souls,[1] its weaving trade was flourishing, and undoubtedly it was now one of the leading cities in Flanders.

On this occasion the Yprois decided to meet their enemies in the open, and under the command of John van Houtkerke the force marched out to the encounter. The French were met near Houtkerque (about 14 miles west of Ypres) and battle was joined. Fortunately other Flemish forces were able to co-operate, and the garrison of Cassel stoutly stemmed one success gained by the French. The Yprois contingent, fighting over ground that neutralised the French horse, overcame their immediate foes, pressed on towards Cassel, and attacked the enemy in rear. The result was a complete defeat for the French, and the Duke of Normandy withdrew his shattered host to France. Much credit must be given to van Houtkerke and the Yprois for taking the field so promptly and not remaining passively behind their entrenchments. As it was they succeeded in combining with their friends on the very battle-field itself and assisted in achieving a remarkable victory.

Between 1348 and 1361 civil strife and severe riots frequently disturbed the peace of Ypres, and a more serious outbreak occurred in 1380. Meanwhile in the war of 1356 between Louis of Mâle, Count of Flanders, and the Duke of Brabant a contingent of over 1100 Yprois acompanied the Count's forces which in October seized Brussels, the Duke's capital, and finally brought about a victorious issue in the following year.

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[1] The figure of 200,000 sometimes given for the population of Ypres at this epoch probably refers to the population of the whole over-lordship. 80,000 appears to be a more accurate figure for the town and its large and extensive suburbs.

(To be continued.)

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THE SERVICES OF THE ROYAL REGIMENT OF ARTILLERY IN THE PENINSULAR WAR, 1808 to 1814.

By Major (Bt. Lieut.-Colonel) J. H. Leslie *(retired list)*.

[Continued from page 249, Vol. LI.]

CHAPTER V (1811).

THE year 1811 was one of great activity in the field, Operations commenced with the retreat of the French army into Spain from the country in front of the Lines of Torres Vedras. This began during the night of 4-5 March. (Oman.[1] IV. pp. 86-7.)

Thereafter actions, combats, battles, and sieges followed in rapid succession.

The various "affairs" of the year, in which the Royal Artillery took part were :—

March 5	Battle of Barrosa[2]	Oman. IV. 107-25.
„ 11	Combat of Pombal	„ 138-9.
„ 12	Combat of Redinha	„ 141-3.
„ 14	Combat of Casal Novo	„ 151-3.
„ 15	Combat of Foz de Arouce	„ 155-8.
„ 25	Combat of Campo Maior	„ 258-8.
April 3	Combat of Sabugal	„ 191-7.
May 3-5	Battle of Fuentes de Onoro[3] ...	„ 310-48.
„ 8-15	1st Siege of Badajoz[5]	„ 379-87.
„ 16	Battle of Albuera[4]	„ 373-404.
„ 25	Affair of Usagre	„ 412-5.
„ 30 to June 10	2nd Siege of Badajoz[5]	„ 404-31.
Sept. 25	Combat of El Bodón	„ 562-73.
„ 27	Combat of Aldea da Ponte ...	„ 579-81.
Oct. 28	Capture of Arroyo dos Molinos ...	„ 602-5.
Dec.	Defence of Tarifa	Oman. V. 114-29.

[1] *History of the Peninsular War* by Professor Sir Charles Oman. 1902-1922.
[2] Journal of the Royal Artillery. XXXVII. 139-60.
[3] „ „ „ „ XXXVIII. 99-122.
[4] „ „ „ „ XXXVI. 49-69.
[5] Unsuccessful.

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"Barrosa" (near the sea-coast, about 15 miles S. from Cadiz), which was an "affair" quite apart from the operations of the main army, will be dealt with first.

It cannot be said definitely which Companies of R.A. then stationed at Cadiz were attached to the three Brigades of guns which formed the artillery part of the force engaged at Barrosa. Officers, N.C.O's, and men were taken from Companies, as required, but from a careful examination of the Muster Rolls of the six Companies shown in the accompanying List, and taking into consideration the several officers who received medals, with the "Barrosa" clasp, it may, I think, be fairly assumed that the guns were manned by detachments from *each* of the 6 Companies.

Cairnes and Raynes, of Dickson's Company, were attached to Roberts's Brigade of guns, and Woolcombe of the same Company was Adjutant to Major A. Duncan, C.R.A. at Cadiz.

Hunt, who was in command of Campbell's Company, and Grantham, would have been entitled to receive the silver general-service medal issued in 1847—if they had been present, as they were then living (see page 405, Vol. LI of the *Journal of the Royal Artillery*). *Some* Officers and men *must* have remained in Cadiz. For list of Officers see page 386.

Major A. Duncan's Despatch (Public Record Office, W.O. 55/1195, p. 111), written on the day after the battle, and addressed to Major-General J. MacLeod, D.A.G., R.A., has never been published. It is here given in full.

Isla de Leon (Cadiz). 6 March, 1811.

Sir,

I have now the satisfaction of making a report to you of our proceedings since the 21st February, which my unceasing occupation from that time has hitherto prevented me from stating in detail as they took place.

On the 21st we sailed from Cadiz, embarking our three Brigades, viz. Captain Hughes, with three six pounders and one Howitzer; Captain Roberts with the same, and Captain Gardiner[1] with three

[1] 2nd-Captain of Roberts's Company.

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nine pounders and a howitzer. From our scarcity of horses and the necessity of attaching six to each six pounder & its Carriages, and eight to each nine pounder, we were obliged thus to curtail the Brigades. On the 25th and 26th, the army arrived and landed at Algeciras and proceeded to Tarifa, the road to which being impracticable for Artillery, the guns and horses went round by sea, and the Detachments marched. As many mules as we could get together here in addition to our horses, were embarked for the conveyance of our reserve gun ammunition and that for the troops, trusting that as we advanced in the country we might purchase or procure others, but in this I was disappointed, so much so as to be obliged to leave at Tarifa a gun from each of the six pounder brigades[1] (the General being particularly desirous that the nine pounders should move complete) in order to forward a sufficient quantity of rifle and musquet ammunition.

At this place [Tarifa] I found Lieut. Michell[2] with two guns, a strong detachment and a proportion of mules for their service. He had been there for some months, detached with the 28th Regiment[3] from Gibraltar.

As they moved forward with the Army and as he had always been taught to expect that he should accompany them, I took him on with me, leaving his guns behind, appointing a part of his Detachment and all his mules to the escort and conveyance of small-arm Ammunition. I must here mention that this Officer's local knowledge (for he had on a former late occasion accompanied the 28th Regiment within a league of Medina Sidonia) and his zealous exertions were of great assistance to me in many instances.

General Graham's dispatch[4] will detail our march, which, when completed, brought us (together with our Allies who were about 7000) nearly abreast of Chiclana, with our left to the sea, where we

[1] *i.e.* two 6 prs.

[2] E. T. Michell, who belonged to Captain W. Morrison's Company, 8th Battalion, R.A., then stationed at Gibraltar.

[3] The 1st Battalion of the 28th (North Gloucestershire) Regiment of Foot. In *Campaigns of the twenty-eighth Regiment* by Lieut.-Colonel C. Cadell, published in 1835, we find on p. 86:—

"On the 13th April [1810], Major [John Frederick] Brown left Gibraltar, with four light companies and a party of artillery under Lieutenant Michell, and took possession of the old Moorish fortress of Tarifa. . . . . In September . . . . the remainder of the Regiment embarked for Tarifa."

This Regiment is now (1926) the 1st Battalion, The Gloucestershire Regiment.

[4] Dated 6 March, 1811.

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arrived yesterday morning[1] after much fatigue to our Horses, but they got through it extremely well.

Between eleven and twelve o'clock the Spaniards were engaged with a body of French Troops immediately on the sands opposite to the point of Santi Petri, and in the wood fronting our position; they then pushed forward nearly their whole force to assist those engaged, and General Graham was ordered to follow with our Troops for the purpose of taking up a position between S. Petri and the Enemy.

No sooner had the British entered the wood, which was of considerable extent, than the main body of the French Troops who must have been well concealed, marched rapidly to possess themselves of the ground we had left. General Graham on being apprized of this (not however until we had considerably advanced into the wood) instantly turned back to meet them. The whole of our Brigades amounting to ten pieces[2] were marching together in column near the front of the Troops; they immediately countermarched with the rest and got out of the wood with all speed. As soon as we cleared it the Enemy were seen to be within 1100 yards, and deploying into line on an advantageous position, whilst ours could scarcely have been worse being much confined, low, and in the midst of high Furze; such was the General's anxiety for the Artillery to get into action that we did so before our Troops were up, so that for more than 20 minutes while our Light Corps engaged the Enemys on their right Flank the ten guns (formed together in line) carried on a most destructive fire against their centre and left Flank. The ground admitted of no manœuvering so that the action very quickly became general and I believe a warmer one never took place. Our guns were much exposed to the Enemy's Light Troops and were, besides, enfiladed from the beginning by their Artillery on our Right Flank.

After an exceeding hot fire for about an hour the General brought up his Second Line, formed closer action and presently charged both forward and to our left Flank where the Enemy had pushed round a considerable force; this ended the day without the assistance (I may almost say) of a single Spaniard out of their 7000!

[1] 5 March, 1811.
[2] Three 9 prs., four 6 prs., and three Howitzers.

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The French drew off leaving six pieces of Ordnance, viz:— Two seven Inch Howitzers, Three Heavy 8 Pounders and one 4 Pounder, with some Ammunition waggons. Two Generals (one of them a General of Division), an eagle and an immense number of killed, wounded and prisoners.

The British have also I fear suffered dreadfully. I must however beg to refer you to the General's dispatches for these Details, and am impatient to report to you that the coolness activity and skill of the Artillery were never more conspicuous than in the conduct of the Officers and men of the Brigades I had the happiness of Commanding; the exertions of every individual in his respective station have been throughout the whole of this expedition beyond any acknowledgement I can make and the fulfilment (or completion if I may so call it) of their duties yesterday surpassed any thing I ever witnessed. I trust you will do me the favour to make a report to this effect to the Master-General of The Ordnance.

Enclosed I have the honour to transmit a return of the killed & wounded, which when the Establishment of our Brigades curtailed as they were is considered, will pretty clearly shew how far we are justified in saying that the action was a *warm one*. It is extraordinary that under such a fire our loss in *killed* should be so trifling, altho' that of wounded is most severe, the whole of the Enemy's Fire being for a considerable time from the commencement of the action directed against the Battery formed by our guns; indeed their whole force seemed to be directed towards us, and occasioned General Graham to make his formation in rear of the guns, so that much of the fire intended for us reached them and caused dreadful destruction.

I must not omit to commend the exertion of Lieut. Wilkinson[1] of the Drivers Corps, and the steadiness of the men under his charge, exposed & unoccupied as they were from the Guns remaining stationary during the greater and severest part of the action.

The British Troops returned in the Evening to this place crossing the Santi Petri River by a bridge that has been for some time constructed there, and at day-light this morning the guns and carriages were passed over.

[1] R.A. Drivers.

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I am happy to add that after the action we were instrumental, notwithstanding the fatigue of the men and horses, in carrying off the Field the wounded on our Guns and cars and waggon; no time was to be lost and no other conveyance at the moment was forthcoming, such was the suddenness of the action, and as for this purpose I received an order to destroy all the musquet ammunition, & employ the carts and waggons for the above purpose.

The Gun detachments,[1] Guns & ammunition of the six pounder Brigades that we were obliged to leave at Tarifa are on their passage from thence round to this place.

I am most truly concerned to state that Lieut. Woolcombe, the acting Adjutant to the Detachment, died this Evening of the wound he received yesterday. A more gallant zealous Officer never existed; to his personal exertions I am so indebted that for every reason both public & private I must most deeply regret his loss. Lieut. Maitland received also a severe wound but from the report of the Surgeons to night there is much hope that he may yet recover, and that a most valuable & promising young man as he is, may be saved to the service.

Lieut. Pester's wound was from a musquet ball through the calf of the leg, but is doing extremely well; the other Officers are in the fairest way of recovery and no unpleasant doubts whatever entertained to the contrary. I cannot conclude without assuring you that the effect of the *Spherical case*[2] was on this occasion conspicuous.

I have, &c.

(sd.) A. DUNCAN, Major, Comg. R.A.

P.S.—In consequence of the great loss of Horses in this affair, I must beg to observe that a fresh supply of them would prove most acceptable, and the old horses not having stood their work as well as could be wished, I am induced to hope the next may be younger if to be had.

(sd.) A.D.

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[1] See *ante*, para. 2.

[2] The invention of Lieut.-Colonel H. Shrapnel, R.A. They were originally called "spherical case shot", and are often mentioned as "Shrapnel's" shells, but the term "shrapnel" was not officially adopted to describe them until 1852.

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RETURN of KILLED, Wounded and Missing of the Royal Artillery, Royal Artillery Drivers, and Horses, in the action of 5th March, 1811.

		Captains	Subalterns.	Staff.	Serjts.	Rank & File.	Total	Horses.
R.A.	Killed	—	—	—	—	3	3	17
	Wounded	2	6	1	—	32	41	22
R.A. Drivers	Killed	—	—	—	—	2	2	—
	Wounded	—	—	—	1	7	8	—
	Missing	—	—	—	1	—	1	—
	Total	2	6	1	2	44	55	39

Names of Officers Wounded.

Captain	P. J. Hughes.	Slightly.	
2nd Captain	W. Cator.[1]	,,	
Ist Lieutenant	E. T. Michell.	,,	
,,	P. J. Woolcombe.	Dangerously.	Since dead.
,,	W. Brereton.	Slightly.	
,,	B. J. Maitland.	Severely.	
,,	C. Manners.	Slightly.	
2nd ,,	H. Pester.	Severely.	

(sd.) A. DUNCAN, Major, Comg. R.A.

Return of the number and nature of guns taken from the Enemy.

Two seven inch Howitzers.
Three Heavy Eight Pounders.
One four Pounder with Cars and Ammunition.

(sd.) A. DUNCAN, Major.[2]

* * * * * * * *

[1] He hunted the Isla de León hounds in 1808-9.

[2] He received a brevet Lieut.-Colonelcy, with effect from 6 March, 1811.

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A List of Officers in the six Companies, R.A., stationed at Cadiz, in March, 1811.

Compiled from the Official Monthly Returns, and Muster Rolls now in the Public Record Office, Chancery Lane, London.

Battalion.	Designation in 1926.	Captain.	2nd Captain	1st Lieutenants.		2nd Lieutenant.
2nd	4th Heavy Battery	P. Campbell[1]	A. Hunt	S. P. Brett	T. Grantham	H. Pester[2]
5th[4]	9th ,, ,,	H. Owen	W. Cator[2]	W. Brereton[2]	G. H. Mainwaring	H. R. Wright
9th	Reduced in 1819 and not reformed.	P. J. Hughes[3]	F. Bedingfield[2]	J. Maxwell	C. Manners[2]	A. R. Harrison
10th	16th Pack Battery	W. Roberts[5]	R. W. Gardiner[3]	W. B. Dundas	R. Home[7]	W. Cozens
,,	32nd Heavy ,,	A. Dickson[5]	R. M. Cairnes	P. J. Woolcombe	W. A. Raynes[2]	L. Talbot
,,	15th Pack ,,	W. Shenley	J. Mallett	B. J. Maitland[6]	R. Godby	T. O. Cator[2]

[1] Serving in the Spanish Army. [2] Silver Medal with clasp 'Barrosa'. [3] Gold Medal with clasp 'Barrosa'.

[4] Muster Roll of March records that one gunner died in Cadiz from wounds received at the battle of Barrosa.

[5] Serving in the Portuguese Army. Captain R. H. Birch, 10th Battalion, R.A., was at this time attached to and in command of the Company.

[6] Embarked for England 2 May. Died at Southampton on 31 October, [illegible], from the effects of wounds received in the Battle of Barrosa. [7] In Portugal.

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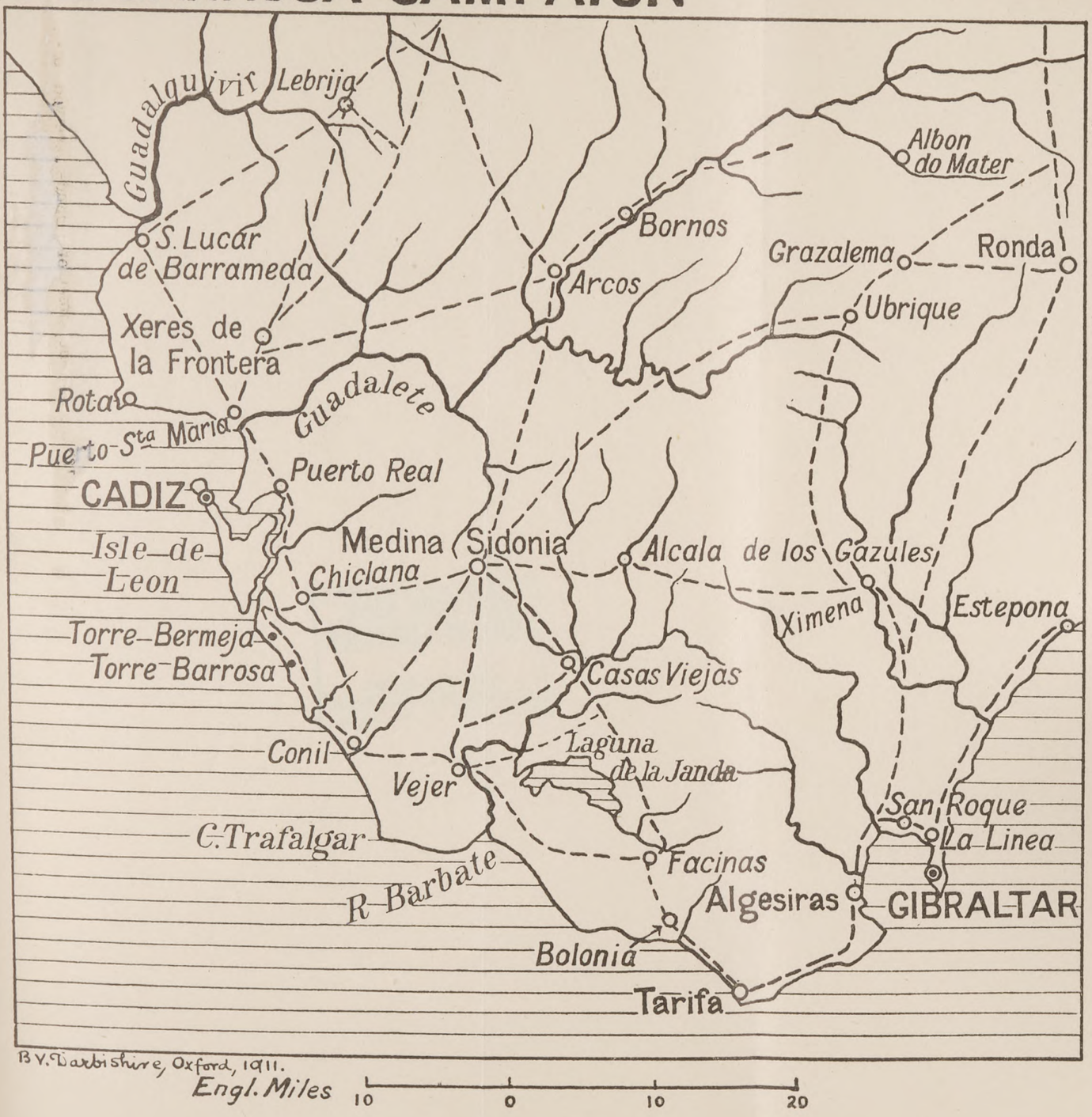
THE BARROSA CAMPAIGN



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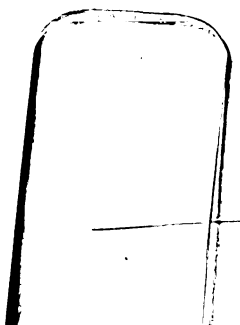

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The British force was commanded by Lieut.-General Thomas Graham. His Dispatch on the battle is printed in *Wellington's Dispatches*, Vol. VII, pp. 381-5. He refers to the R.A. in the following terms :—

> "I owe too much to Major Duncan, and the Officers and Corps of the Royal Artillery, not to mention them in terms of the highest approbation; never was artillery better served."

(To be continued.)

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O.P.F.

The Modern Fortress.

By Captain J. L. P. Macnair, R.A.

I. General.

OVER two hundred years ago Vauban, Marshal of France, designed the fortifications which, up to the present day have protected the frontiers of France. The works raised by Palmerston's engineers at a much later date to guard this land against a feared invasion adopted Vauban's ideas. And the same plan has been followed by nearly every civilised country since his time. It was not until the opening of the late war that Vauban's fortress system was discovered to be obsolete. Liége fell after a short struggle, Namur after practically no struggle at all; Maubeuge was ill supplied and cannot be said to have had a fair chance. Their place was taken by a continuous system of temporary field works.

The German fortresses and several of the French were never severely tried, but one outstanding exception is the case of Verdun. It may be that Belfort, Epinal, Metz or Strasbourg would have stood up as well as Verdun if fully equipped and energetically defended. Is there any possibility then that the condemnation of permanent fortifications was erroneous? In considering the "rule" on which modern fortresses—if there are to be such things—should be built, we must first be satisfied as to this question.

So long as armies continue to exist, countries with land frontiers will always be faced with the problem of their defence. And though we all know that the true defence is attack, it is evident that attack to be good must be concentrated, thereby leaving long lines of country which will require some form of shield. This shield to be of any value must economise in man-power. A few troops must be enabled to hold up a greater number of attacking foes. Some form of trench system, whether there be permanent fortifications or not, will eventually be adopted by

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these troops. The *raison d'être* of the best of the pre-war fortresses was to provide a strong point, a "point d'appui" for this trench system, and the fortress itself consisted of an elaboration of the system, strongly built, ready for use, at short notice, and in an advantageous situation. Theoretically, such a point d'appui, fulfilling all the above requirements, should be an immense advantage to almost any temporary trench system that can be imagined. Some of the fortresses seemed in the early days of the war to be gigantic failures and there was a tendency to abandon them as inadequate and condemned death traps. Later these ideas were somewhat modified; and since the war there has been no appreciable attempt to dispose of fortresses, as there has been for instance of dockyards.

II. The present position.

Assuming then that some kind of permanent fortifications are still required, let us first consider in what particulars present fortifications fail, if at all, to meet requirements. We shall then go on to suggest how possibly they may be better met in the future.

The requirements of a fortress are:—

(1) That it should be a strong point or "point d'appui" of a trench system.
(2) That it should be strongly built.
(3) That it should be ready for use at short notice.
(4) That it should be in a good strategical and tactical situation.

Taking these points seriatim:

1. When studying the history of the French and Belgian fortresses in the war it becomes apparent that those which failed to have any marked effect on the course of events were sited at points which were strategically of great value but which had nothing to do with any temporary or even permanent defensive "system." Their siting had more of an eye to frontiers in the political sense than to the plan of campaign of an army. Those of later date, however, in the south, were constructed as part of a definite defensive plan and connected to a trench system which was in itself almost permanent in places. In spite of this, however, the subsequent temporary trench system seemed to be under the uncom-

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fortable necessity of adapting itself to the fortresses instead of the fortresses forming the foundation and strength of the trench system.

2. The stronghold of Verdun, with its casemates and tunnels, proved of inestimable value in the war as a shelter for personnel, staff and stores; as a sort of organising ground for the surrounding troops. But in view of the experiences of the Belgian fortresses and of Maubeuge, no one thought of concentrating fighting troops and guns in the places intended for them in the forts themselves. It seems fairly evident that no stationary spot on land can be made strong enough both to fight from, and to withstand bombardment. We may be able to make a turret or overhead cover of concrete and steel so that it will withstand an 18 inch howitzer shell. In the end, the shell will overcome it. The most valuable tactical lesson of the war was that concealment was the best protection.

The pre-war fortresses then, from the point of view of material strength were adequate except in so far as fighting troops were concerned. It is to be noted that this limited adequacy was nothing new. Many hours of comparative shelter from the holocaust were obtained in the aged ramparts of Ypres.

3. The immediate readiness for use of a fortress is largely a matter of finance, and consequently it tends to be subordinated to political expediency. It follows that the smaller the building and maintenance cost of the fortress, the more likely it is to be ready for use when required. The French and Belgian fortresses at the outbreak of war were expensive things and their preparedness is less a matter of public knowledge than of private chagrin.

4. The question of the strategical and tactical situation has been put last in the present discussion though hitherto it has probably held first place. The argument is that however good the siting of a fortress, unless it conforms to the requirements of the temporary line it is likely to be of little value and may even be a snare, as Maubeuge was in danger of becoming to the British Army in 1914. On the other hand there will always be places—railway junctions, river crossings, various defiles—which it will be desirable to deny to an enemy for as long as possible at the outbreak of war. Faced, however, with a determined assault, it is doubtful if the forts put to guard such places will in themselves give more than a few hours' grace. It is even more doubtful whether the

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tremendous expense of the fortifications (in the old sense of the term) is worth these few hours. Probably the only solution of this part of the problem of war lies in rapid sectional mobilisation and a prepared scheme. Liége held out for a few days. True they were all important days, but what would the difference in time have been if the Belgian Army had had mobile guns in place of the forts and a well thought out plan of open defence?

It is to be noted that we are dealing here with what is happily called civilised warfare. The forts on the confines of an empire, where the aggressors are inadequately equipped will naturally follow more primitive lines. Their financial aspect is also more local and less pressing.

III. The future.

Having thus appreciated the present position let us consider what form our fortress will take in the future so as to answer these requirements in the fullest possible manner while avoiding the pitfalls of the past.

The three branches that have mainly to be considered are (i) the infantry, (ii) the artillery, (iii) the headquarter services, including command and supply staffs and medical work.

(i) Since the Middle Ages, the infantry have never made a success of fortress fighting, unless they were outside the fort. Their action in the future, so far as fighting is concerned will lie in the temporary line of field defences. We can therefore dismiss them from consideration at this stage, except for the actual siting of the line.

(ii) The artillery require (a) gun positions, (b) ammunition supply, (c) observation posts.

The fixed gun position in a modern war will almost certainly not be a health resort. Even if sited at the bottom instead of at the top of a hill, it will soon be located and its days numbered. The only place where it might be found is for coast defence where more or less direct fire is the order of the day and there will be no forward observing posts. But even here, railway mounting guns firing mostly from behind cover provide an attractive alternative. It is to be noted that a hilly sea front is not a necessity for this type of armament. Artificial flash cover could easily be provided.

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But in land forts there seems to be no question that the mobile or semi-mobile guns will be the pieces to use For these no preparations at all will be necessary. The guns can be kept in store or in barracks and training would coincide with that of the Field Army. The "scheme" would be there, however, the defensive system arranged (depending on the infantry requirements) and the gun positions chosen.

As regards ammunition supply, there does not seem to be any pressing need ordinarily to burden the fortress with a huge stock, so long as the necessary stock exists somewhere. If the necessity for such provision outweighed the expense, underground and fully concealed chambers well within the defensive lines would meet the case.

When we consider observation posts, however, the situation seems capable of considerable development. In the pre-war fort, observation took place from the neighbourhood of the gun. Given a mobile armament this will be out of the question as well as undesirable. Our experience in the war has given us many valuable lessons on the selection of observation posts, none perhaps more valuable than the fact that where no suitable post seems available, one can be made. Some of the best O.P's in France were constructed of concrete and steel in chimneys, barns, ruins of all descriptions, while the artists exercised their ingenuity in fashioning trees of life-like appearance. These are works which on a proposed line of defence, could very well be done in peace time. They could be made quietly with very little expense, in large numbers, and it is thought that with a little management their existence—at any rate the existence of many of them—could be kept quite reasonably secret. One or two would be a nine days' wonder to the boys of the local village, but they would remain unadvertised and would sink rapidly into oblivion until the unfortunate day came when they would be turned to good use. Government tenure of the land would in most cases be unnecessary. Few landlords would object to the erection of inconspicuous small posts in the edges of his woods and fields, even in a corner of a barn. In some cases it would be an advantage to provide covered approach, preferably by small tunnels running back to a covered piece of ground.

It is thought that such a system of O.P's, sited in or even in

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front of the proposed line of infantry trenches, comparatively cheap to erect and requiring but little yearly maintenance, would more than double the value of the artillery and would convert what must by the nature of modern warfare be mobile guns into a solid rock on which to build the foundation of the defence.

(iii) There remain the headquarter services, the citadel, so to speak, of the fortress. Hitherto these have been housed mainly in casemates in the forts themselves. But forts in the old sense of the term will no longer exist. These services are therefore free to seek for themselves a more advantageous position. In the late war, owing to the more pressing demand of the troops in the line, unless some ancient rampart was handy, they mostly found themselves in the open, or in hastily constructed dugouts. But if the fortress is to offer an impregnable resistance to a determined onslaught (which should be the aim and object of a fortress) these services to work efficiently require adequate cover. The need will be met by the construction at suitable points behind the line of strong and commodious ferro-concrete cellars. They could be made under specially selected buildings or under the open fields, deep enough for the corn to grow above them so that they could lie, forgotten to all but the Command Staff records. They would need tunnel connection to the roads so that when opened out for use their approaches could not become obvious to aircraft.

This branch of the fortress would of necessity be rather more expensive than the O.P's. Nor does it appear so urgent. Financial provision could overlook the cellars until the O.P's, the nerves and sinews of the defence, are fully provided.

IV. Subsidiary questions.

Two points have not been touched, viz., communications and anti-tank defence.

It is thought that communications might very well be left till the outbreak of war. In the fortress envisaged above, points will be somewhat scattered and by no means all of them will be used. Buried telephone lines are troublesome to maintain and experience seems to show that they are almost as liable to failure as those that are laid quickly when required. The provision of small tunnels connecting the exposed points to covered ground will probably satisfy immediate needs.

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Anti-tank defence is altogether in the realms of theory and discussion. We do not even really know what it is we shall have to provide a defence against. Probably if the tank enthusiasts were given an absolutely free hand they would plant belts of forest across the path of the invader. For the present it appears unsound to attempt any solid expenditure on so liquid a project but to accept with a guarded mind the comforting truism that the best defence against a tank is a tank.

V. Conclusion.

It will be said that we have dealt almost entirely with the land fortress to the exclusion of coast defence. The answer is that coast defence is hardly carried out by a fortress in the full sense of the term. A defended port will be attacked from the sea by ships which in the first instance will use guns only. An attack by a landing party, including possibly tanks and supported by coastal motor boats cannot be anticipated by placing defences at certain points. It would have to be met by the best advance intelligence and a mobile force. The object of coast defences, organised in peace time, will therefore be to oppose a bombardment, and apart from the air arm, this means purely guns, with the necessary gun control. Consideration will therefore be directed not so much to the best type of fortress but to the best type of gun, and it is not proposed to deal with the matter more fully here except to indicate the well known possible superiority of the railway mounting over the fixed emplacement. Financial considerations make it unlikely that any change in present methods will be made unless this superiority can be proved to be decisive.

Land defences are however another question. In England, the numerous old fashioned land forts have quite naturally been severely neglected. The possibility of such defences ever being required is too remote to call for any very drastic consideration of a new scheme. On the continent, however, it is unlikely that the new frontiers created by the war will be left for ever unfortified, and it will be of absorbing interest to see on what lines the new works, when they arise, will take shape. We must see to it that our interest is not entirely academic. Though England is an island, the Empire as a whole does not share this country's perhaps fictitious

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isolation. An example in the minds of most people nowadays is Singapore. This great base, in the opinion of many, can be defended relatively easily from the sea. If it is ever attacked the chances are at least equal that it will be attacked from the land side by an army landed at some fairly remote and uncontrolled portion of the coast.

Whether then for the land defence of a seaport, or for the protection of a frontier, the fortress of the future appears in its most logical form to take shape as a string of observation posts, splinter proof and permanently camouflaged, sited with reference to the scheme of infantry defensive lines, with tunnels, where necessary to connect them with covered ground. They should be made in large numbers so that the destruction of several will not impede the work of the guns.

These will provide a cheap and efficient back-bone on which to base the defence, and apart from them nothing is really necessary. In very important places where elaboration is called for, the headquarter services will be provided with invisible shell-proof shelter which, as it will not be occupied by fighting troops, can be sited to the best possible advantage for the organisation of command.

If yet further work was contemplated and money could be made available, the next step would be the provision of somewhat similar accommodation for sheltering the reserve troops in the field. This would however mean a great extension of the design, whose beauty so far lies in its simplicity. With all but certain important frontier posts of nations who are either frightened enough or wealthy enough to so elaborate their shield, such provision will probably best be left until war is at any rate threatened.

For the others, those who love and thrive on peace yet fear not war, the "O.P. Fortress" seems to offer a cheap and inconspicuous solution of their defensive cares.

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THE PROBLEM OF THE TANK.

BY "POM-POM."

COLONEL Rowan-Robinson's article in the April number of the Journal of the Royal Artillery must have given many Gunners furiously to think. The future he predicts for the Royal Regiment is not a pleasant one, and these notes are the result of an effort to see if some brighter prospect could not be found.

The gloomy outlook portrayed is based on the assumption that the only effective antidote to the tank is another tank. As a rule, an effective answer to any new weapon produced by an enemy is the production of a similar weapon oneself, yet that does not afford a defensive antidote. For example, in the navy the antidote to long range gunfire was increased armour above the water line; the antidote to this increased armouring was the torpedo, fired from destroyer, submarine, or coastal motor boat; the antidote to the coastal motor boat was the 2 pr. pom-pom. In the army the antidote to the defensive power of the machine gun was an artillery bombardment to crush it, not another machine gun.

That no antidote to the tank (other than another tank) is at present issued is probably due to two reasons:—

1. The need for economy.
2. The desire not to equip units with a new weapon until it is felt that the most perfect and final design has been evolved.

As regards (1), since the fighting arms are at present unable to stop an attack by large numbers of tanks, it is useless to pay for their upkeep in peace if there is any idea of their fighting a European war again. If no additional money can be found for expenditure on an anti-tank weapon, then establishments must be reduced in order to save the money required for this. We should then have an army which, however small, would be able to make an effective resistance to all weapons at present existing.

As regards (2), scientific discovery, which may often render a new weapon obsolescent almost as soon as it is issued to the army,

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necessitates great caution and long and exacting tests before any invention goes as far as the production stage. At the same time, an army cannot be trained for modern war with unsuitable weapons (or none at all). The explanation "Of course, as soon as war breaks out the very latest design will be put into production, and you will be issued with it when ready," will not last indefinitely. When is the army to have practice with some such weapons? The time must come when the risk of early obsolescence must be taken and the fighting arms of the service given their own means of defence against tanks, at least in small numbers.

At present the most efficient tank destroyer is the 3 pr. Hotchkiss gun. A direct hit at a large angle of arrival will penetrate present-day tank armour at 2000 yards. It seems probable that the limiting factor of weight on mobility will keep down the armour of tanks to somewhere near its present dimensions. It is suggested therefore :—

1. That the 3 pr. Hotchkiss gun (or some rather heavier weapon if tank armouring increases) is likely eventually to be adopted as the official anti-tank weapon.
2. That it should not be placed inside a tank because it should be;
   (a) Light—and a tank limits length of recoil and thus necessitates stronger and heavier parts.
   (b) Capable of very wide and quick traverse.
   (c) Easily concealed.
   (d) Easy to load and fire at great speed, and enable the crew to work with the greatest possible freedom.

   If infantry and cavalry are to have mechanical cross country vehicles in their first line transport, it might be carried in one of these, and be dragged into and out of action by the detachment, with some form of wheelbarrow for ammunition; otherwise a special type of limbered vehicle would have to be designed. The weight of the 3 pr. Hotchkiss for use in a tank is approximately 5 cwt. complete. It should be possible, with a longer recoil, to reduce this weight considerably.
3. That there should be two such guns per cavalry regiment or infantry battalion. This may seem a very small allot-

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ment, but working separately two should be able as a rule, to cover a battalion front. It must be remembered that a gun can be ranged best when its own shell are the only ones which can be seen. Nor do we want to produce in peace too many weapons which may rapidly become obsolete. Moreover the number of different weapons now issued to these arms must not be increased by more than is absolutely necessary.

4. That each battery of artillery have two such guns; if horse-drawn, then of cavalry pattern; if dragon-drawn, then mounted on spare dragons which could also be used for gun hauling when required.
5. That as a mobile reserve there should be companies of one or two-man destroyer tanks armed with the tank pattern 3 pr. on a scale of one company (16 tanks) per division. Whether these should be part of tank battalions, or a separate unit under Corps or Division, could be decided after experiment on manœuvres.

We then have:—

(a) A strong system of anti-tank defence sited in depth on tank approaches over the whole front, protecting the arms themselves and the vital services in rear, so vulnerable to tank attack.

(b) A mobile reserve ready to move up and counter attack any tanks which may have broken through the belt of infantry and artillery anti-tank guns; or to move out and oppose any tanks or armoured cars attacking round our flanks.

This then is the picture:—

The enemy launches a tank attack on a divisional front. Our foremost infantry, carefully trained in methods of avoiding casualties from tank attacks, make for any copses, thickets, ditches, and similar tank-proof localities, and remain there till the tanks have passed, ready to emerge and fight any infantry who may follow the tanks. The tanks do not linger here. They are already suffering losses from the battalion anti-tank guns concealed on the edge of tank-proof localities, and they cannot afford to cruise up and down

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squashing individual infantry. The infantry 3 prs. are taking advantage of natural cover from view; gun crews are fresh, have an unrestricted field of vision, and are not being bumped about by moving at speed. Their advantage over the gunners in the tank is enormous. But the task of the tanks is to get through to disorganise vital services in rear. They push on, with diminished numbers, and lose more on meeting the anti-tank guns of the battalions in reserve. Now they are in totally unreconnoitred country. Their crews are losing sense of direction and distance, and their moral is shaken when it is noticed that the number of tanks accompanying them has fallen considerably. The 3 pr. equipped dragons have received warning of the attack, are waiting in position ready for the tanks, and do more execution. A few survivors get through. Divisional Headquarters is in danger. They have been warned of the attack by wireless, however, and at once the divisional destroyer company was sent forward. With machines concealed behind a ridge, company, section and tank commanders see the approaching tanks from the top while still some 2000 yards distant. A plan of action is decided upon, one section is left for the immediate protection of H.Q., and the rest swoop down to the attack. Surprise is complete, and all is soon over. The tank attack has failed.

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CANNON OR CANNON FODDER.

By "O.B.E."

THE usual sequel to a war of any magnitude is that the nations who took part revise their training manuals, and base their principles on the lessons learnt in that war. Then as a period of peace supervenes, gradually the greatest lesson of all, i.e. the preponderance of fire-power, is apt to be forgotten.

Fictitious lessons are drawn from peace manœuvres, etc., and the memory of the casualties incurred at the commencement of each war fades, and as a new generation grows up in the armies, and those with war experience grow less and less, so gradually the effect of modern weapons becomes subordinated to movement. It is obvious that in the revision of handbooks each nation must take stock of the existant material likely to remain of use, the nature of the next war it has to prepare for, and perhaps the most important of all the number of men it will be able to put into the field compared with the man-power of its potential enemy.

It may be of interest to see how France, our ally in the Great War, dealt with these problems from 1871 up to and after the 1914-1918 war. Ever since 1871 the French knew exactly what their next war would be; they knew the scale on which it would be waged; they kept themselves in touch with what was going on the other side of the Rhine; and yet in spite of this were woefully deficient in the weapons which in 1914 produced the greatest fire effect—heavy artillery and machine guns. In an article in the *Revue d'Artillerie*, March-April, 1926, entitled "*Conjugaison des feux d'artillerie et d'infanterie*," Commandant Besnard says that as lately as 1911 General Pétain wrote of the 1875 training manuals "the authors had taken part in the 1870-1871 war, and even after the lapse of four years were still so much impressed by the destructive effect of gun and rifle fire as to base the principles of modern combat on the predominance gained by fire-power. After the Transvaal and Manchurian wars, these principles are proved anew." Besnard goes on to point out how the French gradually forgot that *moral* unaided was quite unable to compete with

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material. It also suited the politicians to forget, for although Germany their potential enemy was known to be increasing her heavy artillery, and to be pushing on the manufacture of machine-guns, the French did not follow their lead. When at last the politicians began to think about spending money on an artillery programme, some genius invented the "disc" which made it possible to use the 75$^{m/m}$ gun as a howitzer, so nothing more was done.

Commandant Besnard says: "it seems unbelievable that while fire weapons were becoming more perfect—more accurate, quicker, longer ranging and more murderous—the pre-war drill book should have laid down that resolute infantry well commanded could advance under the hottest fire even against strongly held trenches, and take them." Now having criticised the French ideas of 1914, and having stated that the greatest fire power was developed at that time by heavy artillery and machine guns, let us examine their problems of the present day. First and foremost, given that infantry can no longer advance against troops who can make use of their fire weapons, are we still to believe the axioms:

(1) Artillery conquers, infantry occupy positions.

(2) The gun is the real infantry weapon.

Although movement against positions means movement accompanied by fire, are we to visualise this moving fire to be produced from behind advancing infantry by guns, or may we reasonably foresee its production partly from mechanical vehicles which will precede infantry. Such will be proof against the small arm weapons of the foremost enemy troops, but will in their turn have to be protected from concentrations of hostile artillery. This doubtless will be the task of artillery, unless aircraft have by dropping gas bombs already neutralised the enemy guns.

How do the present French handbooks cope with these problems? Once more France, in her own opinion at any rate, has the same potential enemy. As far as she can see her next war may be moving warfare, with periods of stabilisation, and all her post war drill books are written on these lines, and take into account all the lessons gained in the great war. Her handbooks take stock of the material at her disposal, and she fully realises that shortness of personnel makes it impossible for her to sacrifice needless lives during the opening stages of her next war. The peace treaty

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prevents her potential enemy from pursuing the course she did from 1871-1914 so that now the 1914 position is reversed and Germany must perforce aim at imbuing her citizens with the *moral* to fight an enemy depending largely on reduced effectives backed up by a preponderance of *material.*

So it would appear that France, taking her low birth rate into consideration and her potential enemy's crippled state, will aim at reducing her infantry or rather releasing them from the rôle of "cannon-fodder" by increasing and perfecting her material means.

Now for a glance at Germany. Certain weapons are forbidden to Germany by the peace treaty, and her army is reduced from a national army to a small professional long service force. On what lines is she to base her training to meet the menace of France's material strength.

One may be forgiven for supposing that she will look for some new weapon which may revolutionise warfare as we knew it in the late war. We may suppose that she will make use of propaganda to elevate the moral of her own population, by trying to prove to them that tactical handling allied to moral courage will make them capable of defeating material strength.

We all know how in 1918 the tactics of defence were modified to avoid the casualties caused by concentrations of artillery, how the front line became a mere outpost line, and how one became prepared to give up a strip of ground so that live men should exist to carry out counter-attacks. Again we know how our tanks upset these tactics. The tank is one of the weapons forbidden to Germany by the peace treaty, so that it is not surprising to find that Germany does not believe in tanks. Certain German writers claim that dependence on tanks cramps the initiative of infantry and destroys their moral.

Anyone who can read French might read Colonel Alléhaut's "La guerre n'est pas une industrie," which is a translation of the German General von Tayzen's "Material oder Moral" (published in 1922), and which is a criticism of modern French handbooks.

Our own problems must perforce be very different from those of France and Germany, but we should never forget the devastating results of concentrations of fire, and I write this article in the hope it may help to "rub this in" and that it may induce a readier pen than mine to enlarge on this most important subject.

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IRAQ AND MOSUL.

By Lieut.-General Sir George MacMunn, K.C.B., K.C.S.I., D.S.O.

1. The Frontier Agreement.
2. The Strategical and Political Aspect.
3. The Future of Iraq itself.
4. The Administration.
5. Defence.
6. The Assryians.
7. Trade Industry and Trade Routes.

The Frontier Agreement.

THE Agreement of Turkey to the ruling of the League of Nations with regard to the frontier of Iraq and to the general boundary line, is a satisfactory conclusion to one of the most difficult of the problems which the war has left on our hands. It is perhaps still more valuable in that it definitely marks an improvement in that curious stirring of Eastern bile against Great Britain during the years subsequent to the Armistice. Great Britain had gained immense prestige as the staying force among the Allies, had most effectually protected her own eastern subjects and allies from the pressure of war, had treated her Turkish prisoners with great humanity and was prepared to help in Turkish reconstruction. Yet, in all eastern countries, an untimely anti-British wave had arisen.

It has been slowly receding, and the fact that Turkey has openly announced the common-sense opinion that Great Britain is too important as a friend to be quarrelled over concerning Mosul, denotes a not unimportant change in the atmosphere.

The agreement between the British and Turkish Governments, signed at Angora on June 5th, lays down the frontier which follows the Brussels Line with the exception of a small amendment to bring the road between Alaman and Ashuta within the Turkish territory. It is a trivial amendment and does not really alter the Brussels Line which is a slight modification of the boundary of the old Mosul Villayet or province.

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The line itself runs east and west in its general direction, though with many undulations, and as the crow flies is just over 130 miles long from Pesh Khabur on the Tigris to the Gadir Pass on the frontier of Persian Kurdistan, following for the first fifteen miles from Pesh Khabur, the right bank of Khabur river and for fifteen miles more that of its tributary the Helik. Thence the course is along convenient water partings and hilltops and nowhere is there a line of strategical value. North of the line are the great mountains of Turkish Kurdistan and the highlands of the Assyrians, about Hakiari Julamerk and Neri. South of the line are more, though lesser, mountains which gradually run down to the plains of Nineveh and the open valley east of the Tigris.

Through the centre of the frontier line, from out of Turkish Kurdistan, run the waters of the Greater Zab which join the Tigris south of Mosul. From the western extremity of the boundary between Iraq and Turkey the frontier between Iraq and Syria runs south-west to the Euphrates in a line which is little more than a compass bearing. The Turk cannot approach Mosul on the western side of the River Tigris except by crossing a tongue of Syria which intervenes between Turkey and Iraq, the boundary between Turkey and Syria running practically east and west from Nisibin to Jezira-ibn-Umar on the Tigris, which is 17 miles north of Pesh Khabur. In the hills south of the new boundary there is neither town nor river of importance, and though beautiful and fertile valleys occur, the country is largely holly-clad hills and precipitous gorges, inhabited by a portion of those Kurdish tribes whose economic life has always been connected with the Tigris Valley.

Sir Ronald Lindsay in obtaining the acquiescence of Turkey to the frontier line has no doubt succeeded in allaying the genuine fear in Turkish minds that we intended to use the Kurds of Iraq as a focus for stirring up anti-Turkish sentiment among the Kurds of Turkish Kurdistan—which fear had a considerable share in creating the Turkish claims to Mosul.

The Strategical and Political Aspect.

While the question of the future of Iraq, as well as the inclusion of Mosul therein, was going through its last stages before

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the League of Nations and the House of Commons, there was a very strong attempt made in a portion of the British press to persuade the public to wash their hands of the whole business. It was urged that it was a financial drain that we had no right to put on our taxpayers and a political and military danger that we had no right to assume. The attitude was the same as that taken up by certain obdurate and influential members of the American Senate as regards the liabilities of the United States towards Europe, with the essential difference that their views have regard to a future policy, while Great Britain is concerned with one of unavoidable consequences of our action during the Great War. The view of H.M. Government, and of the great mass of the public is that for reasons good or bad, but which seemed right to the Government of the day, we went to Iraq and eventually became involved in very large operations there, taking on, by deliberate and solemn promise, very special obligations to the whole of the Arab subjects of Turkey.

The pros and cons of our Arab policy can be a matter of endless discussion, the wisdom or unwisdom of the promises we gave and of our attempt to raise Sherif Hussain of Mecca and his family to the Arab hegemony may easily be condemned. When the reasons came to be fully known, the verdict of history will probably be that we made the best of a difficult and unsatisfactory situation. But that is neither here nor there in the immediate matter of the future of Iraq. We had promised to make the Arab free of the Turk and support an Arab kingdom. In Iraq, which was occupied from the beginning of the war, we used every influence in our power to enlist the support of local opinion and local action and our Government supported by the public approval have insisted that our pledges must be redeemed.

The corollary of the situation was that without the debatable Mosul province, wrested from the Turks by force of arms in common with the provinces of Basra and Baghdad and an integral part of the economic system of Mesopotamia, the new state could not look for financial equilibrium, and further that, without prolonged British support and tutelage, it could neither survive, nor attain that equilibrium, even with the possession of Mosul.

The State of Iraq has enthusiastically and thankfully accepted

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the signing of the Agreement and the Secretary of State has been the recipient of grateful and complimentary acknowledgments from the Iraqian Government, as indeed he and H.M. Government well deserve. That Iraqian memories are likely to be long is another matter, for the Arab mind is proverbially a fickle one. Relieved of the fear of a Turkish attack, the politically minded of Iraq will ere long attribute any untoward condition to the baleful influence of Great Britain, for that is for the moment the disease from which the East suffers. Happily there are some signs of its abatement and the Agreement with Turkey is concurrent with a lower temperature in other countries, for the East still loves a man, and we have been able to play the man lately rather more than during the first aftermath of the war.

Strategically the new frontier has no significance—strategic and defensible frontiers are never easy to find and as has been explained this inter-mountain frontier has no impassable barriers, though military forces of any size can only reach the Tigris plains by crossing the tongue of Syria already referred to. Turkish troops could only do so by direct agreement with or in direct defiance of France. And though the fact remains that we have added to our responsibilities a frontier marching with a considerable and uncertain power, the point of strategical pressure by Great Britain would always be in the Levant unless such a world upheaval occurred as produced a repetition of the vast river operations which we were led into in the Great War.

The long frontier of Iraq which marches with Persia is, of course, an added source of possible friction in which we may be concerned; on the other hand our relations with Persia, as regards trade and business have always been good; Persia, in the hands of what promises to be the first competent government for a hundred years, can only need more trade and more business, and remarkable to state, appears to be becoming a barrier, rather than an easy prey, to Bolshevism. There will be room for customs and minor frontier wrangles between Iraq and Persia, but British influence should always suffice to ensure their settlement on amicable lines. On the whole we shall probably gain in the future by closer intimacy with Persia, but, on the other hand, there is no getting away from the fact that the circumstances that drove us to Iraq has undoubtedly

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widened our daily liabilities. There are, however, many compensating factors in the present situation, which, though by no means a justification for the deliberate adoption of responsibility for Iraq in ordinary circumstances, have considerable value in the balance sheet that has been forced on us. In the first place there is the age-old question of slave running in the Gulf. Our present position in Iraq and the Persian Gulf has prevented any possible recrudescence of this activity. We tolerate existing servitude, but we can now prevent fresh negroid slaves from being imported. The arms traffic, the smuggling of arms into Central Asia and Afghanistan via the Gulf which gave so much trouble in the years preceding the war, is now dead. The mere disappearance of these two troubles alone is a very tangible gain. But the main anxiety for ten or fifteen years before the war, was the Baghdad railway and where its terminus should be, and who should exercise control over Kowat and its potential harbour. The whole of these intriguing questions and all the trade aftermath that they might involve are now settled and can only arise again in a form in which they can be dealt with fairly in the general interests of the world. With these old bogies dead and buried, the silver lining to the cloud is by no means trivial.

The Future of Iraq itself.

The foregoing pages deal with the problem of Iraq so far as Great Britain is concerned—as regards the country itself, what are its prospects? The answer is not very easy to find, because the future of any Arab race as a self-governing community belongs to the realm of experiment. The glory of the Arab as an empire builder departed many centuries ago and has yet to grow again. The ruler is a member of the Hashimite family, the son of Sherif Hussain for some while King Hussain of Mecca who failed, failed rather piteously in the race to which fate had called him. Will he make good where father and brother failed? The answer lies wrapt in the future. King Feisal is an Arab of the Quoreish, and his name stands prominently in the roll of Mecca as a descendant of the Prophet. He is tall and handsome and gracious. He has therefore many of the ingredients of success. Best of all under the circumstances he is safe in knowing that the British are his very

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disinterested advisers and will see his throne safe if he will let them. His subjects are polyglot, Arabs of the Sunni or orthodox persuasion like himself, Arabs in large numbers who belong to the other great division of Islam, the Shiah sect, Kurds who are orthodox, a considerable population who are Christian and many thousands of Jews. Of Turks, despite the Turkish outcry before the League of Nations, there are practically none, the few Turcomans who speak Turki are Seljuks of a wave of invasion far earlier than the followers of the House of Othman. There is perhaps safety in a polyglot folk; but it is the Shiah Arabs who will be most out of sympathy with King Feisal, should his rule fail. The Shiah priesthood is always ready for intrigue and because of the fact that the great sacred places of the Shiah lie in Iraq, it is a particularly powerful body.

The immediate problem on which all political rule must really lie is that of finance, and it is one of very considerable import to Great Britain. Can Iraq attain and maintain financial equilibrium? The progress made under this head is very interesting.

In 1924, a mission from the British Government, consisting of Mr. Hilton Young, M.P., and Mr. Vernon, visited Iraq to prepare a special report, of which the general purport was that the deficit between revenue and expenditure had decreased regularly year by year for several years and that equilibrium was now practically assured, but that there were two causes that would tend to disturb it. One was the impending incidence of the agreed share of the Ottoman Debt, and the other the cost of extra Iraqian troops to replace Indian troops which the British Government were about to withdraw. Since that report was issued the revenue has further increased and normal equilibrium obtained, but the service of the Ottoman Debt,[1] estimated at 85 Lakhs, still produces a difficulty.

The British Government has now helped to place the railways and the Port of Basra on a substantial footing, by waiving any capital value to which Great Britain might be entitled and for which some form of interest would be due. The railways had of course a lot of part-worn and old stock, but the Port is a first-class piece of work and a very considerable asset. The waiving of this value

[1] For those who do not understand it, it may be stated that much of Europe is represented in the bondholders of the Ottoman Debt and that each dismembered portion of the Ottoman Empire was required by agreement to take on itself a due share of the debt, even if it had had in the past little or no specific advantage therefrom.

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and due interest, is the simplest and least expensive way of assisting the young Government to get on its feet and meet its liabilities for the Ottoman Debt.

It would seem that the demands on Great Britain except for the expense of Air Force and military support are largely over. These, however, can never be met by Iraq and must be looked on as one of our war liabilities. It is the price paid for the quite remarkable preponderancy in the affairs of the Middle East, which fate has thrust on us which must have even now many indirect business advantages and in the future should bring many more.

The Administration.

The administration of the country has steadily been converted from the provisional semi-military control under British officers which naturally endured during the war and while the future of the country was under discussion to an Arab one. That administration was a story by itself, a quite remarkable one in its way, and it was useful apart from its actual work, in giving many Arabs and Kurds a direct knowledge of British officers and British ways, a knowledge which has left behind a considerable liking. The sour anti-British bile is engendered in the political hotbeds of the town-talkers and never in the country-side.

The transfer of the administration from British to Arab hands has been carried out with considerable success, and Government were fortunate in having to their hands officers displaced from Egpyt with a knowledge of exactly the same shadow system of advice as was required in Iraq. The Arab ministers and officials now carry on with a small cadre of British advisers to assist them. The many plans for development formed in the years immediately following the war have been held up by the financial conditions of the country. The Arab eagerly demands modern improvements, but has not yet the resources to pay for them. Colleges, schools, hospitals, roads, bridges all progress steadily on sound lines, but perforce far slower than the enthusiast could wish.

The opening of the motor route across the desert makes Northern Iraq look more than ever to the west for its ideas and has minimised that isolation which was its earlier condition.

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Defence.

The indigenous military forces are interesting. First come the Levies, the remnant of the British occupation and a quite useful force commanded by British officers which remained remarkably staunch during the rising of 1920. The Levies are a substitute for additional British ground troops and belong to the transition period. Behind the wall of British troops, air and ground, and the Levies, the Iraq army, with its British advisers, is steadily attaining reliability. A flourishing cadet college is training young Arabs and Kurds to be officers, and the Iraqian troops proper have already taken the field against the Kurdish disturbers of Sulimanieh and Rowanduz. They are modelled so far as may be in the various arms, on the usual British lines and number between 7000 and 8000, and there were sufficient Arab ex-officers of the Turkish army available to form the first officer cadre. There seems no reason why in due course they should not be competent to take on the ordinary troubles of the kingdom, the Kurds of the hills and the Sheiks of the plains and marshes who demur to revenue charges

The Assyrians.

It is not possible to write of the recent settlement without some reference to the small but interesting people, the Assyrians, about whom we hear a great deal from time to time. They are undoubtedly a war legacy. Stirred by Russia and the Russian invasion of Turkey, they rose against the Turkish Government and with the collapse of Russia were driven out. So far as Turkey is concerned they have made their bed and must lie on it. Expelled from their mountains in the midst of Kurdistan, they came in great destitution into the British lines with all their people and belongings guarded by their militia and have been supported at British charges ever since. An admirable race of mountaineers, they have everyone's sympathy, but it is not easy to give effect to it. Bred for many generations on the snow-line, they cannot settle and live difficulty in the plains of Mosul and Baghdad. It was never possible to bring their lands, the mountains of Tiari and Hakiari, where their villages were mixed up with Turkish-Kurds, into the confines of Iraq, even though they lie but a few miles north of the new frontier. The best that can be done for the people is to settle them in Iraqian Government

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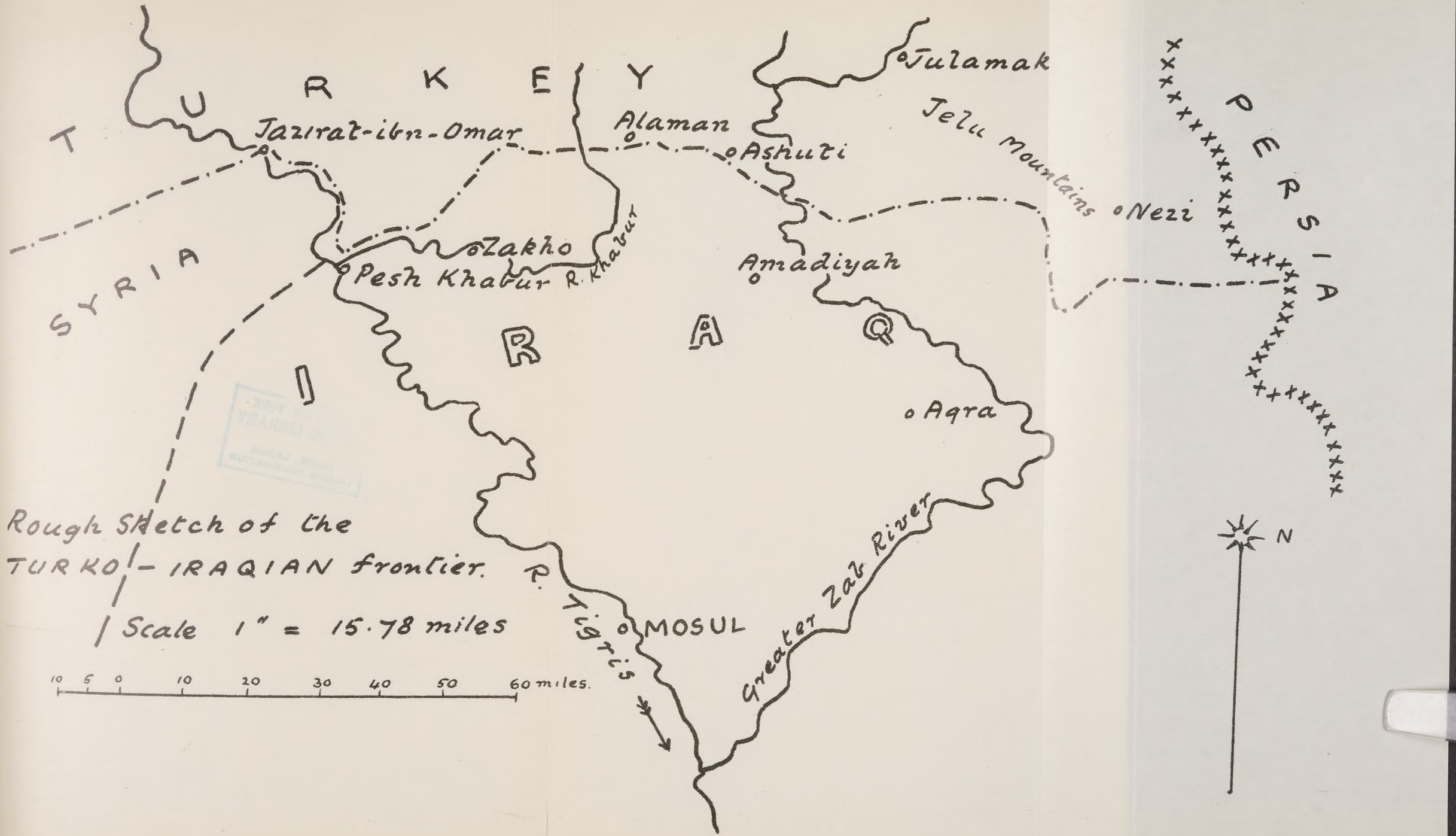

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lands in the lower hills near the Khabur and the greater Zab, within the territories of the Mosul province. It is not an ideal settlement, but it is a possible one, and from the Iraqian point of view has the merit of planting a very sturdy desirable frontier people along the boundary with Turkey. Their Patriarch, now a young man, is being educated at Canterbury, and his aunt, the Khanun Surma, is also in England. The Patriarch of the war was murdered by Kurds on his way to join the British; his nephew, who was inducted in Baghdad, died in a few years and this young man has been installed in his stead. The solution of this problem has always been the special care of the High Commissioner.

Trade Industry and Trade Routes.

The main export trade from Iraq is dates, of which the bulk goes by sea all over the world from Basra itself. In days gone by the "Date race" for the first new cargoes of dates into North American ports was almost as exciting as the earlier "Tea race." The first few cargoes fetched very high prices. The remarkable food value of the date is now recognised and the export to Europe and America total many thousands of tons. In Basra alone there are said to be eleven million trees, which pay a revenue in the neighbourhood of a shilling each per annum. That trade will always increase and the gardens of the Shal-El-Arab fringed with a half-mile fringe of gardens for over a hundred miles, has the remarkable facility of the tidal river and tidal irrigation. During the war many thousands of tons went home to the Food Controller in the ships which had brought out military stores. The gardens are planted on neatly dug gridirons of small canals; twice in the twenty-four hours the tide rises 9 to 12 feet and fills the canals to overflowing with fresh water backed up by the tide. That tide can irrigate and carry merchandise up the Tigris and Euphrates for over a hundred and twenty miles. It was to this that the Psalmist from the tideless shores of Palestine referred when he exclaimed "Turn our captivity, Oh Lord, as the rivers in the South."

There is a small export trade in wheat and rice, a trade which could probably be multiplied a hundred-fold, nay a thousand-fold, should a time ever arise when the world ran short of cereals. Then the League of Nations could overrule the Arab's dislike of

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strangers, revive the Babylonian canal system and pour in Indian colonists to grow corn. The only doubt in the success of such a scheme is the degree of *salinity* in the neglected soil which may make the problem of washing very serious.

The real interest of the world in Iraq lies in the oilfields. The oilfields of South Persia deliver their oil into tankers in the Shatt-el-Arab. It was the necessity to cover these fields that took us to Basra in the first instance. But oil is to be found in large quantities up the Tigris, though in what quantities cannot yet be told. Much of it is not very accessible until the world demand and the world price cover the cost of long pipe lines. The new treaty between Turkey and Iraq enacts that for a period of 25 years Iraq shall pay Turkey a royalty of ten per cent. on all oil dues; it also provides that Iraq shall, if she so desire, buy these out within twelve months from the signing of the treaty for the sum of half a million, and it is understood that this is to be done.

The story of the trade routes with Persia is an interesting one. Persia is curiously placed with reference to the Gulf. The routes from any Gulf port to her important centres are very long and extremely difficult, over mountain ranges of considerable peculiarity and, speaking generally, are only open to pack animals, though it is true that during the war the British did so improve the route to Teheran from Bushire that a Ford car could get through. The routes from the Gulf are from Bander Abbas, from Bushire, and from Muhammerah in the Shatt-el-Arab, the latter up the Karun River—a trade route kept open by the enterprise of a British firm and known as the Lynch road.

Directly after the war the plethora of cargo steamers on the Tigris, the opening of the railway line through Baghdad to Khaniquin and the Persian border, whence the British had made a motor road to Hamadan to join there the Russian road, drew trade to North Persia by that route. The Bolshevising of Georgia and the Caspian still further threw all Persian trade on to this route. Once trade has taken to a route, and found security, it is apt to stay there, and there is no doubt that Mesopotamia will see the bulk of the North Persia trade for many a year to come, which will all mean enhanced influence and prosperity.

Then it is to be remembered that Baghdad is but the lineal

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descendant of Ctesiphon and Babylon. They all lie within a fifty-mile ring, and they are all places at the end of the river traffic where trade leaves the *baylum*, the *shaktur* and the *mahela*, as the various types of boats are called, and takes to the caravan. Baghdad is now the centre where rail-borne and steamer-borne trade takes to the caravan, except consignments for the Persian border. The northern deserts and South Kurdistan and all the towns further up, trade by caravan with Bagdad, and every year that trade increases. It used to be the trade of Austria and Germany—a portion of it is now the trade of Britain.

There is one industry that the world is calling aloud for. It is the supply of long staple cotton. Since the war experiments have produced a long staple cotton in Iraq and already concessionaires are growing cotton—and if this development is a commercial success, the whole future of the country is assured.

On the Diala River, east and north-east of Baghdad, cotton irrigation is now an important business, while engineers are exploring Sir William Willcocks's scheme of letting the flood waters of the Upper Euphrates into the Habbana depression, thus obviating the devastating floods which now occur and letting them out in time of low river. It will resemble the ancient story of Lake Moeris on the Nile whose bed now is the fertile area of the Fayum and is a scheme of great potentiality and will require a considerable capital.

With the Turkish trouble settled and a future ensured for some years there are prospects of capital being available for any reasonable schemes, and the comparatively uneventful years since the war may give way to a steady agricultural and industrial progress. It is to be hoped that Great Britain, who has borne the burden of Iraq so long, will have every concession and advantage which may fairly be given to outside agencies, for the labourer is worthy of his hire.

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AFGHANISTAN.

By Major G. M. Routh, C.B.E., D.S.O., R.A.

THE country of the Amir is so seldom visited by Englishmen that a few notes on the position by an officer recently (November 1925) in Kabul might be of interest. Britain, like other powers, is represented by a Legation, but unlike the others, the English colony is confined to the Minister and his staff, so that few details of the country find their way home.

Yet Afghanistan is passing through an important phase, a phase which has considerable bearing on the world politics of the day. Before studying the internal position, however, a review in perspective of external influences might be of interest.

External influences.

Afghanistan, on the North-West Frontier of India, runs contiguous to the British and Russian frontiers, which are thus separated from Persia to China by a buffer state designed by the Durand Commission of 1904 to prevent frontier incidents. Up till 1919, Britain conducted any Afghan foreign communications, but since the 3rd Afghan War, the subsidy has been stopped and the Amir now controls an independent state and conducts his own foreign policy through the various Legations.

Russia.

This would work with complete harmony but for our restless neighbour beyond the Oxus. Ever since 1877 when the Allies vetoed the warm-water outlet at Constantinople, Russia has been scheming for a southern port, and extending her Empire in Asia. In 1885 she came in collision with the British at Penjdeh near Herat, and in 1904 with the Japanese at Port Arthur. The effect of the revolution has been a stiffening of the former policy, coupled with an openly expressed hatred of the British Empire and the employment of methods such as those at Elizavetpol and Bokhara, which the Czarist regime might have considered unduly

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harsh. After the war, the Soviet made various unsuccessful attempts to unite these various eastern dependencies for a common purpose, only to discover that the conservative people of the East can no more be united to the same outlook than the Hindoo and Moslem in India. After the sack of Bokhara in 1920, the error of this method became evident and the policy was changed. A system of racial disintegration was then adopted, and small republics were established on an ethnological basis, any one of which could be coerced at leisure independently. Thus instead of the old principalities of Bokhara and Khiva, these are now represented on the north of Afghanistan by the Soviet Republics of Turkmanistan, Usbegistan, Tajikistan, and Kara Kirghiz, each following ethnological divisions having direct tribal connection with existing Afghan communities south of the Oxus—each of these small states is suitably maintained in contentment until further developments render such altruism needless.

Russia makes no secret of her designs on India, and large sums of Soviet money are spent in the cause of disaffection, working with agents in India from Central Asia. So long as a strong and independent Afghanistan, however, intervenes between the two frontiers, any armed attack on India would be futile. A double line of rail would be needed to serve a modern army attacking and vast concentrations of depots and stores would be needed at some spot far more adjacent than the last terminus of the railway from Bokhara at Termez, on the Oxus. The defences of British India, both in the Khyber and at Quetta, the only possible routes for a modern army, are of remarkable strength, and backed by the might of the British Empire, a successful offence would require numbers and training not now attainable in Soviet Russia.

But there are other ways. A change of policy in Afghanistan, due to the death of some responsible personality, or to other causes, might make the task easier. The preparation at leisure of an advanced base of Soviet power in a friendly Afghanistan would bring India face to face with circumstances which might strain its resources to breaking point. There are several ways which an unscrupulous power can achieve these conditions even in the teeth of Afghanistan. First comes the power of money, subsidising disaffection and chaos against law and order, offering something

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to those who have nothing to lose at the expense of the existing owners who have traditionally been in the position of stern masters. When the Afghan proletariat, exploited themselves by an eastern potentate much as they were before the Christian era, see contented people in the neighbouring republics under a Government so far strong and apparently benign, enjoying many of the amenities of civilisation, some of them at least are apt to make comparisons. Why should not they too profit by trade and the comforts a railway can provide? Better housing and cheaper food and clothing appeal to the masses. Agents provocateur in the shape of an ever increasing number of traders, engineers and officials, are not wanting to point out the evils under which they now labour and the benefits of Soviet rule. In Herat it is made known by organised propaganda and by subtle suggestion that only one-third of the population is Afghan and the remainder are Arab or Balooch. Would they not be happier like the people of Merv or Penjdeh as part of the powerful Russian Empire? Soviet money continues to be lavished on peaceful penetration and trade subsidies till the people begin to rely on Russian enterprise, and so the game may go on till one fine morning the Amir may wake up to find his boundary 100 miles further south, a regularisation of the new status quo which has been gradually coming into being.

These subterranean forces of penetration are difficult to counter. Communications in Afghanistan are still primitive. The railhead at Termez brings Russian influence at least as near the Northern Provinces as a Central Government at Kabul connected by pack transport, and Russian survey parties have openly surveyed road and rail routes to the Anderrab Valley, a mere fifty miles north of Kabul. An Afghanistan, shorn of its northern provinces, even supported by Great Britain, would form a feeble buffer against further Russian aggression. These are a few of the contingencies we must consider, whether we are studying world politics or Imperial defence.

Progress under present Amir.

On the other side of the penny there are hopeful signs. The Amir, Aman Ullah, is a ruler full of character, brains and initiative, with the well-being of his country at heart. Untravelled

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and uneducated, he has yet arrived at many of the essentials needed to bring his kingdom into line with modern progress. In the face of great difficulty he has insisted on compulsory education. His place in the sun, or in the comity of nations, is vindicated by Legations which ensure his diplomatic entity. Advantage has been taken of the rates of exchange in Germany and Italy to import European doctors and engineers. The latter have continued the policy of Abdur Rahman in making the country so far as possible industrially independent of India, and developing factories for guns, leather, soap, textiles, etc. They have electrified Kabul and beautified the city. Five miles south a new capital is being constructed, Dar ul Aman, laid out on modern lines with vistas and avenues and well built buildings, both private and state, comparable with anything of its kind in Europe. The Army and Air Force are being re-organised on a national basis. Equipment of all kinds is being reviewed and modernised. Intensive training of the Headquarters armies is being attempted and young officers are being brought up to a higher standard of war tactics under the Arkan-i-Harbi, or Military School. All this has been done in spite of the opposition of the Mullahs, naturally averse from progress which might lessen their influence, and in spite of the recent Mangal rebellion which put a very severe strain on the resources of the Government.

Communications.

Afghanistan is probably, at the moment, by far the most isolated state in the world. Mosul and Bokhara were once harder to reach but communications to these places have now improved. Its frontiers on the north and west are naturally weak, while comparatively strong on the south and east. On the north, the Oxus is about 20 marches by pack transport from Kabul, through various defiles which offer little real difficulty to an invader, except in the matter of distance. Herat on the western frontier is easily accessible from railhead at Kushk Post, but 29 marches from Kabul. Kandahar in the south is surrounded by deserts and is difficult of access except from Kabul and Quetta. It follows, therefore, that the majority of the traffic with the outside world is through British India via the Khyber Pass, a route which is passable for motor traffic over difficult gradients and bad surface, but yet passable.

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Physical conditions.

The area of the country is 245,000 square miles (about 700 miles by 350)—a trifle larger than France—but of this the whole is so mountainous that only about 10% is capable of cultivation, apart from about 16% which is desert, and only about one-tenth of this arable area is actually in cultivation in any one year. This area tends to be reduced rather than increased by the Moslem custom of cutting trees without replanting, a practice which, meteorologically, has the effect of substituting destructive torrents for gentle rain. The whole country is under snow at times and the climate is very severe indeed, nor will the warmest sheepskins exclude the bitter winds blowing down the valleys from the great snow masses. The water supply is precarious except near the main rivers, and timber of all sorts is difficult to come by.

Population.

Obviously these conditions tend to breed a hardy race, where only the strongest can survive. Fiercely jealous of their independence, and till lately cut off from the outside world by their trackless hills, the tribesmen have a fanatical hatred of foreigners deeply seated in their natures. They were first united at the end of the 18th century by Dost Mahommad Khan and can only be controlled with success by such outstanding personalities as this Amir and Abdur Rahman who also imposed his will with a ruthless vigour which appealed to the Spartan characters of his subjects. Realising the hardships and vitality needed for an Afghan to reach maturity, they tend, as a race, to despise foreigners whose subtlety or science appears to Afghans a poor set-off against their own more obvious bodily strength and warlike prowess. True, the improved communications of the last decade have had their effect even in Afghanistan, and men are beginning to realise that other methods of living are not without their compensations. The Ghilzais for instance, embracing nearly a quarter of the population, migrate yearly to the plains of India, where they penetrate even as far as Burmah, and cannot fail to notice the changes coming over the unchanging East in these latter days. The country cannot remain a backwater for ever, and it is possible that the progressive methods of this ruler embody many of the ideas of his subjects,

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existing but perhaps not yet reaching the stage of national expression.

Retrospect.

A brief glance at the history of the country might give an insight into present conditions. The various tribes have been known as Afghans for about a thousand years, although they have only existed as a kingdom for under 200 years. Herat and Kandahar were once Persian, while Kabul and Ghazni acknowledged the Mogul dynasty at Delhi. Persian was, and is, the court language. Following on efforts of consolidation by the Ghilzais and Abdalis in the early 18th century, a dynasty of the latter seized the country on the murder of Nadir Shah in 1747 and assumed the title of Durani, with an empire from the Oxus to the Sutlej, including Kashmir, Sind, Baloochistan, the Punjab and Khorasan. But as often in the East, Durani power waned once the strong arm of its creator, Ahmed Shah, was removed, and the next stable government was under Dost Mahommad in 1826. Official relations with British India were opened in 1809, as a result of Napoleon's intrigues in Persia.

In 1828, the British took action to counter Russian and Persian intrigues, and decided on sending a force to relieve Herat and to replace Dost Mahommad by Shah Shuja who was likely to be more amenable to influence. War commenced in 1838, a leisurely, wasteful campaign, penalised from the start by lavish baggage, faulty leadership, and departmental ineptitude, but saved again and again by the sturdy heroism of the British troops who refused to acknowledge defeat although often pitted against a better armed enemy. Kandahar, Ghazni and Kabul were occupied in turn, and Shah Shuja was duly placed on the gadi, with a meagre garrison of one division of all arms to support his unpopular rule. Now followed a succession of criminal errors, both in policy and strategy. The army was encumbered with the families from India and the tribes were conciliated by payments instead of coerced by force. Hatred of the foreigner combined all classes in a fanatical antagonism to the British. In 1840 the Army was persuaded to leave the strong position of the Bala Hissar and occupy the Sherpur

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cantonment. Supplies became scarce, and on the 6th January, 1842, the shameful retreat commenced, guaranteed with treacherous assurances of safe conduct by Mahommad Akhar Khan. The force, if force it could be called, amounted to about a thousand British, four thousand Indian troops and twelve thousand followers, and many women and children. What followed is graphically described in Lady Sale's diary. The followers were slaughtered like sheep. Soldiers, demoralised by disgraceful concessions and vacillations, put up a poor fight against the knives and jezails of the fanatical Ghilzais who rushed them in detail in the narrow passes. A starving remnant of 45 officers and men made a final stand on a mound near the road at Gandamak, sixty miles on the Jelalabad road, but only one officer, Dr. Brydon, reached Jelalabad (110 miles) to tell the tale. Probably this was the most serious reverse sustained by the British Army in the East, nor has the Afghan forgotten it. The avenging force under General Pollock could not entirely undo its failure.

In 1855 an offensive defensive alliance was concluded between Dost Mahommad Khan and the Government of India, on a basis which still holds generally. During the Mutiny a British Mission was in Kabul and this influence sufficed till 1858 by which time the worst in India was over. Dost Mahommad meanwhile annexed Kandahar and Herat, and all went well till his death in 1863, when the usual succession difficulties arose, and Persia seized Herat while Russia made important advances in Central Asia. British diplomacy in settling new boundaries displeased the Amir, Sher Ali, who considered himself insufficiently consulted, and incidents accumulated until a British Mission was refused while a Russian Mission was entertained—a distinction which led to the second Afghan War of 1878-80.

This war, though relieved by the genius of Lord Roberts and others, showed lamentable defects in medical, transport and supply. Intelligence was defective and the campaign was hardly a shining example of frontier warfare. Conditions, however, were imposed and a British envoy was sent to Kabul, only to be murdered in September, 1879, together with four officers and seventy-five men of the Guides. Retribution followed, swift and drastic; the Bala Hissar was razed to the ground by Lord Roberts, and other penalties

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Barracks near the old Sherpur Cantonment.

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were exacted, but here again the return to India supplied little incidents like Maiwand which testify rather to the gallantry than the military arts of the British Army of those days.

Then followed the Penjdeh incident in 1885 already referred to, which nearly caused war between England and Russia. It was settled in Europe and resulted in hurried boundary commissions to remove future grounds for friction on the northern and western Afghan frontiers. In India, elaborate and costly defences were constructed in the Northern Punjab, athwart a possible Russian line of advance. Now we class these as expensive makeshifts. We can no longer afford even to contemplate the possibility of any Russian force in British India.

Afghan intrigues on the N.W. frontier of India in the nineties led to a series of British Punitive expeditions, culminating in the Durand Boundary Commission in 1894. Abdur Rahman had by this time broken the power of the chiefs and galvanised Afghanistan into a powerful and well armed military state. The terror of his administration was so formidable that on his death in 1901 his son, Habib Ullah, was able to ascend the gadi almost without opposition, and to administer himself almost unchallenged up till 1919. His friendship with India was a factor which had, of course, an important bearing on India's contribution to the Great War. It was only in 1919, on his assassination, that the usual succession troubles recurred until such time as his successor, Aman Ullah, the present ruler, was able to consolidate his power. He bought his experience in the third Afghan War, an experience he would probably hesitate to repeat. War at the moment would cripple his various improvement schemes, and as his rule becomes stronger every month he survives, he is not likely to forsake the substance in pursuing the shadow. But it is not man who disposes and other circumstances already touched on might still prove too strong for him.

Peshawar to Kabul.

Possibly a few details of the writer's actual journey and experiences might be of interest :—

Once the journey was decided on by those concerned, the formalities of passports and visa had to be complied with. Let no one imagine that urgency or convenience will hurry the machinery

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of the Afghan Consul General in such cases. The dignity of a Sovereign State precludes hurry, and patience becomes a necessary virtue. But it's a long lane that has no turning, and the party, consisting of the writer and two Indians, left Peshawar at 7 a.m. in November in a Dodge car hired from a local firm at Rs400 (£30) for the return journey—204 miles each way. The Khaiber Pass has now a broad gauge railway, but through passengers usually motor through from Peshawar, this method being quicker and more convenient than a break at Landi Khana (28 m.).

On the British side of the frontier a baboo duly recorded the various irritating details on our three passports. Two hundred yards further on was the Afghan post, whence somebody, best described as a male person, came down without undue haste to meet us. After a close inspection he returned to his hut on the cliff and telephoned to Dakka, six miles on. Apparently his description found favour and we were allowed to proceed.

From now onwards the track was unmetalled, but as the weather was dry, the Dodge springs good and our digestions above suspicion, the only thing that suffered was our pace. Dakka proved to be a collection of a few score mud huts, to one of which we ascended, and shook hands with various persons, all apparently with exceedingly good intentions but not imbued with that spirit of hustle, which, as no doubt they have calculated, reduces longevity in America. Various details of age, past, peculiarities, birth marks, sex, etc., had to be entered in the records, but the process and the friendly converse being as good a way of killing time as most, occupied us a full hour.

The track now follows the Kabul river more or less. Various German engineers are laying out a new alignment for the road, but as they control the technicalities and not the funds, laying out may last five years. At the same time the existing track is quite passable in good weather, and the ground is generally level. In fact the whole fifty-eight miles from Landi Khana railhead to Jelalabad could probably be completed with broad-gauge track at a mile a day in emergency.

Beyond a puncture or two all went well to Jelalabad, our halt for the night. We passed a landing ground three miles out, and heard that the Amir trusts much in his air service to keep his

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frontiers quiet. Jelalabad is the centre of a fertile plain on both banks of the Kabul river. The walled city is less than half a mile in diameter, but much of importance, such as Abdur Rahman's old Bagh-i-Shahi, the new palace, Habib Ullah's tomb, the barracks, jail, and many villas are to be found outside. The new palace is a modern affair, well laid out, and fitted with electric light. An Englishman can walk about in safety alone, a state of affairs, one is told, due in a large measure to the influence of the present Minister.

The car, and incidentally, the Legation weekly Crossley tender halted for the night in the British Consulate, which is directed by a consul born in Dera Ismail Khan. It is a comfortable serai and house rented from the Afghans. Here money was changed, at the rate of about 9 annas—say 10½d.—for a Kabul rupee.

Next day was to be a long pull rising 8,000 feet in ninety miles, so a start was made at 6.20 a.m. (5.20 local sun time), using the head lights. It is usual to make Nimla, twenty miles on, the first day, but as the guest house is an Afghan one, certain previous formalities are necessary, hence the halt at Jelalabad. The house which we passed about 7.30 at Nimla is in a well wooded garden in attractive surroundings with snow clad hills.

Now the ascent began. The Dodge was pulling well, but the second gear slipped a bit, and the road was bad, full of boulders and rough stones, with diversions through torrents, where, as in most cases, the bridges were out of repair. The driver stopped about three miles short of Jagdalak for food at 10 a.m. Good progress so far. Now, however, the clutch jammed and a puncture delayed matters. We had only spare tubes left and both spare wheels were in use. There came a very steep and stony ascent after Surkhpul Dak Bungalow and delays continued. Twenty-five miles out of Kabul we were in the snow on both sides of the road about 9600 feet up, freezing hard. There was a delay of two hours here owing to the spare tubes being defective, and involving the removal of no less than four outer covers. By now it was 5.30 p.m. We passed the dam in the Khurd Kabul pass built for hydro-electric purposes. The scenery here is very rugged and impressive—a fitting site for the disaster to British arms in 1842.

Twilight found us at Butkhak nine miles from Kabul, the out-

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side customs station. Here some Afghan baboos strolled along, patted the driver, sounded the horn and behaved generally in an engaging and childlike manner. They only delayed us five minutes. Next we arrived at the city examining post just outside Kabul. Here was another bonhomie merchant, who finally expressed his affection by depositing his portly frame on the pile of baggage for a joy-ride into the city. And so we reached the Legation just before seven with a thirst of great value.

The Legation.

The British Legation is situated in a serai once used by the Amir's "Anderum," or harem. The main portion is about 80 yards square, with a wall 23 feet high, all rooms facing inwards. Pending the construction of buildings suitable to the status of a first class power about a mile away, this site is being rented at the same figure as the Afghan Legation in London. Originally of a distinctly Eastern flavour it has now been adapted to the requirements of a Legation with extraordinary taste and culture, and one feels that the honour of England is duly upheld, and also that one is entering an Englishman's home.

The guest chamber consists of two rooms 16 feet by 20 feet, and a bathroom 16 feet square, all well but simply furnished. The Staff consists of the Minister and Lady Humphrys, the Councillor, Secretary, Doctor, and Military Attaché. These, with four British clerks and one British P.W.D. Engineer and his assistant building the new Legation, constitute the entire English colony, the smallness of which gives us an advantage over the other nations, who are handicapped by the need for protecting a number of their nationals employed by the State on often very inadequate wages.

Kabul from the hills above the city.

As the car only reached Kabul at dusk, it was not possible that night to form a good idea of the city, so well known to the British Army in 1840 and 1880. The next day, Friday, however, is observed as a *dies non* by the Afghans and no work was possible, so the obvious thing to do was to climb the Asmai hill about 1000 feet (6918) above the Legation. From here a magnificent view of the Kabul Valley is obtained. The main valley is about five miles by

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Kabul—from Asmai Hill—showing racecourse, Arg, Palace and Sherpur Cantonment, but not the native city.

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twenty, running north and south. Looking north was the Sher Darwaza hill (7280) on the right, with the great city immediately below it. Beyond the city one sees the site of the Bala Hissar destroyed in 1880 by the British owing to the murder of the four British officers and their escort of seventy-five Guides. Beyond that, about three miles distant, is the once fortified Siah Sang (6186). Due north lay Lord Roberts' Cantonment of Sherpur, about one mile by half a mile, of which half is now barracks and half a landing ground. In the far distance, over a hundred miles away, lay the great white barrier of the Hindoo Kush, showing up a glittering mass against the snow ranges all round the valley. On the left is the Bagh-i-Bala, the house where Abdur Rahman died, now a hospital. Just below is the site of the new Legation now being built, laid out with modern comforts on English lines. The reception room is 80 feet by 40 feet and all the other rooms are on a similar scale, including a billiard room and a squash court. The staff are housed in separate parts of the garden, which is about 400 yards by 600 yards. Looking south on the right one sees Paghman, the Eylaq or summer retreat of the Kabul society. South-west runs the motor road to Ghazni and Kandahar, crossing a pass about twelve miles out. Due south is a long straight broad road running five miles clear to Dar-al-Aman, the Amir's new capital. On the left is the tomb of the Emperor Baber on an outlying spur— a rugged and majestic site for the simple soldier's grave.

Summer retreat.

Next day, after lunch, came a journey with our hostess in the Wolseley car to Paghman—about nine miles out and 9000 feet up, roughly the November snow level. This is the summer capital, and consists of about 200 houses built on the Riviera model. The whole area is planted with fruit trees and well laid out, without the cutcha etceteras one associates with the East. A cinema and theatre form part of the plan, and the foreign office, council chambers and other Government buildings are all included. The trouble about Kabul in summer is the wind and dust, although the temperature itself seldom goes over 105°, so that this retreat is much appreciated. The Amir's house is at the top of the slope, a beautifully planned modern villa rather marred by the brilliant

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Venetian red colour wash. The garden is laid out in terraces, and near the house are a drawing room on a sort of roofed chibootra and a billiard room of the same structure. The garden is full of statues, then being covered with date matting against the winter snow. Some thirty or more peacocks, one pure white, add to the landscape.

Above the villa—presumably beyond the carry of the human voice—is the "Anderum," or women's apartments. One sympathizes with the sagacity which prompts placing the women where they are available as required, but only as required. Large additions are in progress. But then we ourselves might tend to become more domesticated under such ideal arrangements.

After leaving Paghman we motored about eight miles along the side of the hills to Beitut, one of Abdur Rahman's hunting lodges which was lent to the Minister one summer. It is built on the edge of a steep slope overlooking a wonderful panorama. The builder was English and the possessor it seems of imagination.

The new Capital.

We returned towards Kabul but struck right and south about two miles out towards Dar-ul-Aman, the capital now being built by the Germans. It is a city of vistas, laid out on impressive lines. The Mujlis Chamber (or Houses of Parliament) is sited on an elevation at the end of the broad five miles road with 100 feet of metalling, while behind the Mujlis is the Palace. The houses are all very well built on what appears to be a suitable plan for the climate, i.e., like an Indian bungalow with bedrooms over the larger central rooms.

A ride to the north.

After work next day, four of us, one a lady, went for a ride on the plain. This is an area five miles by one on the north-west of Kabul. In winter half of it becomes a lake, with wonderful colouring. Now it affords perfect cantering for miles. We had a good view of Kabul and the Behmaru heights above Sherpur Cantonment. The place of execution was pointed out, mostly gallows, but the Afghans run a special line in stoning which is said to be less comfortable owing to the studied absence of hurry,

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which, if desired, is obtained by propelling the offender from a gun. We saw the power lines from the hydro-electric installation at Jabel el Siraj Cantonment about forty-five miles north of Kabul. At the further side of the plain we came out at the old aerodrome, now under Bolo management. Three "piadeh" or infantry soldiers dashed out 200 yards to warn us off. But we waited with quiet persistence for an officer, listening to the cackle of drill repetition, and deprecating the somewhat forcible efforts of the three soldiers to send us back, although the C-in-C had agreed to our riding here. The officer arrived, a dear little boy of about sixteen. He tried hard to look stern, but soon broke into a giggle, and told us all would be well if we made a slight detour, which we gracefully did. Coming back we passed through part of the old Sherpur Cantonment, now made into an aerodrome. The whole place has been razed. Hangars have been constructed on the south and west, and the air power of the future will be centred here. Behmaru hills on the north are a distressing obstacle at a height of 6,000 feet where the air is far from buoyant, but the space is a large one, and they'll make it do. We got home about six. It freezes hard all day in the shade and we were glad of a good fire in the very comfortable drawing room.

On Monday 15th, a party of four went to a jhil about twenty miles out and brought back a bag of fifteen duck and fourteen snipe. They reported very heavy going and all got into black mud over the waist.

The city.

One afternoon was spent riding in the great city with a sowar. Here 150,000 people are concentrated in an area considerably smaller than Westminster, a hive of narrow streets, covered bazaars and struggling masses of pedestrians and pack animals. The bazaars are the clubs of the Eastern world and meet the need for social intercourse, in which of course the equality of sex is on a very different footing from the West. Anyone dropped in a parachute into this curling tangle of obscure alleys would find it hard to say, apart from the language, whether he had alighted in Stamboul or Damascus, Baghdad or Teheran, Aleppo or Bokhara. One is very much like the others. Perhaps in Kabul the Eastern politeness

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with which the European existence is ignored is a trifle more studied and deliberate. The Afghan can afford to adopt an attitude impossible in other cities where European influence is a far sterner factor. Here such Europeans as exist are mostly ill-paid subordinates, jostled with the rest. The British Minister whose prestige stands very high in the land, makes a great point of his own small colony making their occasional visits to the city on horseback, aloof from the surging of the crowd. From this point of vantage they can observe the landmarks of city life, customers and coolies, shrouded mysterious women and canine scavengers, priceless silks and age-long filth in close contact. But modernism is creeping in already. Motor horns tootle through the winding passages, here and there being straightened out into broader highways. People find the value of sites on the new arteries compensates for the cost of purchase and demolition of their old hovels. Electricity is replacing oil, the Germans and Italians are slowly importing the amenities of civilisation into the capital, which, like London, forms the very centre of national life.

Personalities.

During the five days in Kabul one had opportunity of meeting many of the people that mattered. Their manners are good and one cannot but be attracted by their frank friendliness if one meets them in the right spirit. The War Minister struck one as efficient, and seemed to have his house in order. There seemed something indescribably reminiscent of the French Army in their ways of doing business. The Brigadier with whom the writer had most to do was a man one could enjoy as a guest in any Gunner Mess, but for the language bar. He had a true appreciation for Rabelaisian stories in Persian, a trait which proved to have value even in official business. Lieut.-Genl. Sami, recently head of the Military College, was another attractive personality. He was a genial Arab, with an uncanny aptitude for military science, very popular among Europeans in Kabul. These and the old world hospitality of the British Legation made a very pleasant interlude in Kabul—days which can never recur, for all too soon this quaint old capital will be caught up in the maelstrom of progress and modernised out of recognition.

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Back to India.

In the end we crept out of the frozen city just before dawn. The pass of 9600 had to be negotiated, and water for the radiator had to be carried separately, only ice being available on the road, and we plodded on through intense cold, hairpin bends and rocky goat tracks for thirteen hours before we covered the 110 miles to Jelalabad. The rest was easy.

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MUGGER SHOOTING IN INDIA.

By "Ubique."

INDIA is a land of big rivers and in most of them crocodiles are to be found. Up till quite recently they were seldom shot because tiger, panther, bear and many other species of game were plentiful and the average Englishman despised the "mugger" as a quarry, but now that expense has ruled out so many shooting trips there are many keen shikaris who have turned to crocodile shooting rather than put away their rifles altogether.

There are two distinct types of crocodiles in India—the "Crocodilus Palustris" or mugger proper and the "Gharialus Gangeticus" or gharial. The former is a flesh eater and lives in ponds or rivers with jungle covered banks while the latter is a fish eater preferring broad rivers with sandbanks and mud flats. The two are not difficult to distinguish for while the true mugger has a short snout in which the teeth are unevenly placed, the gharial has a very long pointed snout. Generally speaking the mugger is found in Southern India while the fish eater inhabits the northern rivers, especially the Indus and the Sutlej. About eighteen feet is the extreme length of a gharial but the fish eater often exceeds twenty-three feet or more.

The crocodile is well endowed by nature with means of protection for his back is covered with heavy, bony scales of great hardness which are practically unaffected by a soft nosed bullet. His neck, however can be easily penetrated while the white skin of the stomach is greatly prized on account of its toughness. The mugger has a formidable tail of great strength and a blow from it will easily knock over a man or break a leg. The enormous leverage of the heavy jaws enables him to snap a bone with the greatest ease though it is curious that the teeth are very brittle and will not allow him to tear a victim to pieces as is popularly supposed. The crocodile normally drags his prey under water and

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drowns it after which it is disposed of at leisure. Usually he prefers to hide the body in some hole in the river bed until it is putrid, though hunger will sometimes force him to make a more hurried meal. Goats, cattle, water buffaloes, deer and human beings are all likely prey of the mugger and in some parts of India the loss of life caused by these reptiles is very serious. Buffaloes wallowing in shallow water are dragged down, women washing their clothes are seized, fishermen wading in the river disappear and it is no wonder that the Sahib with a rifle is welcomed by the exasperated villagers. In most cases it is the true mugger who is responsible, for the gharial lives almost entirely on fish, but the bigger gharial do sometimes take to a flesh diet. The writer recently shot a sixteen foot "fish-eater" which was undoubtedly the cause of a water buffalo's sudden disappearance a few hours before.

Although the crocodile lives almost entirely in the water he sometimes makes quite considerable journeys overland, when compelled to seek a fresh home owing to the drying up of his pond during the hot weather. It is surprising how quickly he can move on land in spite of his short legs, and it should be noted that he waddles with his body off the ground and does not crawl. These overland trips are, however, only taken in cases of necessity but all crocodiles love to bask in the sun on a sandbank and this is the opportunity for the sportsman. During the hot weather the water is so warm that there is no inducement for a crocodile to leave it, but on a sunny day in the winter months he will select some sloping sandbank and lie for hours in the sunshine. The mugger is never far from the water—usually within a yard and is generally seen with his head towards the river. He nearly always chooses a sandbank in mid stream and for this reason the hunter seldom gets a shot at less than a hundred yards range and two hundred yards is more usual. The slightest sign of a human being is enough to frighten the crocodile so that careful stalking is required.

The best way to approach mugger is to drift downstream in a boat. A look-out man in the bows equipped with glasses should be able to spot the quarry some hundreds of yards ahead and the boat is then gently paddled into the bank. Having decided from where he expects to get the best shot, the shikari should land and approach this point by a detour, taking great care to avoid being

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seen or heard. He should then examine the mugger carefully through his glasses while he waits to get his breath. It must be remembered that a crocodile must be hit in the neck thus severing the spinal column and causing instantaneous death. Any other wound, though it may be fatal, will not take immediate effect, and it only requires one flick with the powerful tail to put the mugger in the water and out of sight. It is very difficult to realise the extraordinary vitality of a crocodile but it is undoubtedly true that to shoot at any point other than the neck is merely a waste of time and ammunition. Now the neck of say a ten foot crocodile at two hundred yards range is not a large target and good shooting is needed to get a bull first time. Even if the bullet hits the target squarely the mugger is often only partially paralysed and not killed and may require several more shots to finish him off. A case recently occurred where a fourteen foot gharial was hit by two soft-nosed bullets simultaneously in the neck but yet required nine more hits before he died and by then the body was half in the water. One can afford to take no chances with a mugger, as the writer can testify after having been implicated in a brawl (in company with another officer, two coolies and two terrier dogs) with a "dead" six foot mugger which came to life half an hour after being hauled into the small boat. It sometimes happens that a crocodile which has been badly wounded and which has succeeded in regaining the water will return to the sandbank after a short interval. The reason for this is doubtful but probably the small fish in the water cause him so much irritation by tearing at the raw wound that he is driven onto the bank to escape their attentions. If the mugger is mortally wounded he will die in the water rather than on land and the body will sink. It will come to the surface in about twenty-four hours time but the chances of recovery are small for the stream may take it many miles down river.

The mugger should be skinned as soon as possible after death but in the Punjab it may be done in the evening after settling into camp. An incision should be made along the sides of the stomach above the legs. The back is useless but the skin of the stomach, throat, legs and the underneath portion of the tail should be removed in one piece. The skin should then be scraped clean and packed in salt—not alum. It is important to keep the skin

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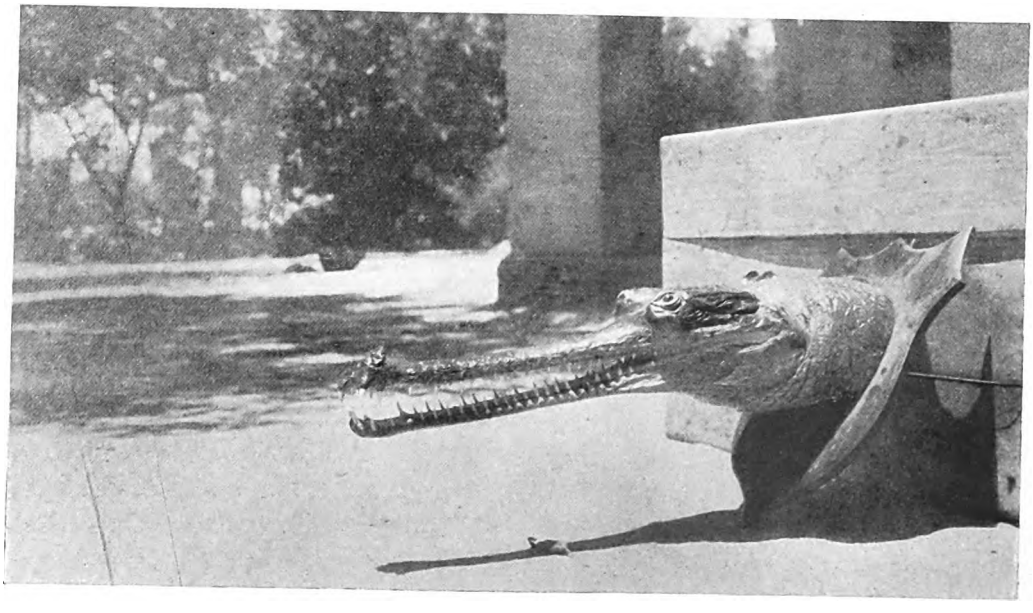
A 14½ ft. Gharial shot in the Sutlej river.



Head of 14 ft. Gharial.

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moist until it can be despatched to a tannery for proper treatment. Skins can be cured in any bazaar but it is better to send them to a good tannery (such as Shewan's Tannery, Cawnpore or the North-Western Tannery, Cawnpore) as the bazaar native uses chemicals in the tanning process which are injurious to the leather. The process takes about six months and costs between one and two rupees a linear foot but the finished product is valuable and is worth waiting for. If it is desired to retain a mugger head, care should be taken to see that plenty of the skin of the neck is left attached. Every particle of flesh must be removed from the skull and the tongue cut out together with the eyes. In the case of either skins or heads the really important point to insist on is that the trophies should be sent to the tanner as quickly as possible and should reach him moist as well as salted. The most fatal mistake to make is to dry a crocodile skin in the sun or near a fire.

Almost any modern small bore rifle firing soft-nosed bullets is suitable for mugger shooting but for the larger crocodiles a calibre of at least 350 should be used. Owing to the very great accuracy required it is advisable to carry two small forked rifle rests, one made of wood for use in sandy soil and one of iron with a sharp point for use on hard ground. A telescopic sight is also a great help and indeed almost a necessity, for it is practically impossible to see the neck of a small mugger over open sights at two hundred yards range. Plenty of ammunition should be taken for if mugger are at all plentiful a hundred rounds per rifle in six days will be found to be an average expenditure.

The writer and another officer went on a mugger shoot from Ferozepore (on the Sutlej river) last cold weather and found that the following arrangements worked very satisfactorily. The shikari was ordered to have two boats ready and into one was packed all the baggage, tents, provisions together with two bearers. This boat was instructed to follow a quarter of a mile behind the first. After proceeding upstream for four days, the return journey was made in two days. Camp was pitched on the river bank about sundown each evening and a start made about nine o'clock each morning. (The mugger do not leave the water till the sun has been up for some hours and has warmed the sandbanks.) The expenses of this trip worked out as follows:—

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	Rs.	As
Tongas, etc. (6 miles) from railway station, coolies, etc.	10	0
Hire of two boats and coolies for 6 days at Rs6 per boat per day	72	0
Shikaris' wages, coolies' buksheesh, etc. ...	10	0
Food, etc., for 2 officers for 6 days	50	0
200 rds. ammunition (100 rds. per rifle) ...	60	0
	202	0

The total bag was 26 mugger varying in size from 15 feet to 4 feet with an average of just over 6 feet, so that mugger shooting cannot be said to be an expensive amusement, especially if the value of the skins be taken into consideration.

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ROYAL ARTILLERY, 1815.

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ADMINISTRATION IN THE FIELD AS AFFECTING A DIVISION.

By Colonel F. D. Logan, C.M.G., D.S.O.

Administration is a big subject and embraces :—

Provision of supplies. (Note :—The term "supplies" includes food, petrol, fuel, forage, medical comforts, oil and disinfectants.)

Conveyance of baggage.

Provision of ammunition, transport, ordnance stores, R.E. stores, water, personnel, labour.

Medical, veterinary and postal arrangements.

Provost duties, repair and upkeep of roads, accommodation, baths, laundries, salvage and transportation, disposal of prisoners, graves, pay, discipline, spiritual and moral welfare of the soldier, printing, stationery and works services.

In a short article it is impossible to deal with all the above, it is therefore proposed to take only those subjects which chiefly affect the normal daily work of a unit in the field, viz. :—

1. Supplies.
2. Ammunition.
3. Ordnance stores.
4. R.E. stores.
5. Medical arrangements.
6. Veterinary arrangements.
7. Postal.
8. Baggage.
9. Provost duties and traffic control.

Before proceeding to details it is necessary to have a knowledge of the general administrative organisation from which a division draws its supplies and other requirements.

When a force of any size proceeds overseas the first task is the establishment of its base and the distribution or lay out of the various administrative installations within the base area. This lay out is a matter of the utmost importance as on it depends very

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largely the future efficient working of the administrative services and the welfare of the troops. This task involves dividing the base area into sub-areas for :—

(1) Docks.
(2) Transportation services.
(3) Ordnance stores and workshops.
(4) Supply depots.
(5) Transport depots. M.T. and H.T.
(6) Animals. (Remounts.)
(7) Veterinary hospitals.
(8) Medical, hospitals and convalescent camps.
(9) Rest camps.
(10) Depots for personnel.
(11) Training area.
(12) Ammunition dumps.
(13) R.E. stores.

and also in establishing a Regulating Station.

A regulating station is a railway installation with a number of sidings radiating from a central point where trucks can be collected and marshalled into trains for despatch to the front. (See Manual of Movement, p. 99 *et seq.*)

From the Base Commandant's point of view the ideal lay out is to have distinct sub-areas for each of the above, so situated that they can be suitably grouped together for purposes of command. This, however, will not always be possible. There are many factors which affect the problem. Road communication, railway facilities, sidings and stations, anti-aircraft defence, position of suitable buildings and ground, allowance for future expansion, water, etc., etc. The whole subject of a base organisation requires an article to itself and is outside the scope of this paper. It is sufficient for our purpose to show that a base is laid out with the various installations required by the different services suitably placed within the areas. The field army is connected with the base by the line of communication area. If this intermediate area is of any great extent, rest camps, advanced depots of all kinds and such other installations as required may be established and an advanced base may have to be formed.

The requirements of the field army are normally provided

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from the L. of C. area. The guiding principle in sending up supplies, etc., is to make the fullest use of the most economical means of transport. Where rail or water transport is available, supplies, personnel, etc., are sent up by these methods as far forward as conditions will allow, and road transport used only in the latter stages of the journey. In most cases this means supplies, etc., are despatched by rail from the base to certain railheads allotted for the purpose by G.H.Q. For large forces certain stations are allotted as supply railheads, others as ammunition railheads, others for evacuation of sick and wounded, for receipt of remounts and despatch of horse casualties, for entrainments and detrainments, for receipt of R.E. stores and possibly as sidings for dumping road metal. When the force is small only one of each kind may be necessary and in the case of R.E. stores and road metal may not be required at all. The allotment of railheads depends on the railway facilities which exist. These are selected according to the general situation. To be of any use as a supply or ammunition railhead, one or more sidings each capable of taking a complete train of 50 trucks are essential, and these sidings must be accessible to road transport, so that supplies, etc., can be unloaded direct from trucks into vehicles. Each siding should be long enough to take one train. This will obviate splitting the train, and the less shunting required the easier for railway working. Approaches should, if possible, be good with suitable traffic circuits and concealed from hostile observation. Supplies (food) should not be worked from the same railhead as ammunition. An ammunition railhead should be situated if practicable on a side line so that in the event of explosions there is no risk of the main through line being put out of action.

The road links connecting railheads with the field units in a division are important and their organisation should be thoroughly understood by all officers. They consist of :—

1. Maintenance Company, R.A.S.C. (A Corps unit, one for each division, which takes the place of the old Div. M.T. Co.)
2. Divisional Train, R.A.S.C.
3. Ammunition Co., M.T., R.A.S.C.
4. Divisional Ammunition Column, R.A.
5. Reserve H.T. Co., R.A.S.C.

} Divisional units.

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NOTE.—A Divisional M.T. Repair Co., R.A.S.C., is now to be included in the war establishment of a division to carry out minor necessary repairs which may be required by the M.T. vehicles in the formation.

The Maintenance Company consists of a H.Q., a supply section and an ammunition section. Its vehicles are 3-ton lorries. The supply section at present consists of 53 vehicles.

For supplies	41
,, Ordnance stores	4
,, M.T. stores	1
,, R.E. stores	2
,, Petrol cans	2*
,, Spare	2
,, Petrol tank (600 gallons)	1

The ammunition section consists of 55 3-ton lorries divided into 4 sub-sections.

One Sub-Section.	For S.A.A. and grenades, etc.	21	3-ton Lorries.
,, ,,	For 18 pr. ammunition.	15	,, ,,
,, ,,	For 4·5″ how. ,,	12	,, ,,
,, ,,	For 3·7″ how. (pack).	4	,, ,,
	Spare.	2	,, ,,
	Technical Equipment.	1	,, ,,

The functions of the Maintenance Co. are to convey supplies and ammunition from railheads to certain points in or close to the division area, where they are handed over to divisional supply and ammunition units as described below.

The Divisional Train under the new organisation consists of :—

(a) H.Q.

(b) Four M.T. companies serving Div. Troops and 3 Infantry Brigades respectively. Each company consisting of 2 sections (one baggage and one supplies).

The supply sections of the train are the connecting link between the Maintenance Co. (Supply Sec.) and units. (As to baggage see below.)

The Ammunition Co. consists of 2 sections, a S.A.A. section for S.A.A. and grenades, and a gun section for artillery ammunition.

* The increasing difficulty of the provision of petrol cans, due to the advent of the roadside petrol pump, will probably require certain modifications to be made.

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It is the connecting link between the maintenance company (ammunition section) and the infantry brigade ammunition reserves in the case of S.A.A. and the artillery wagon lines or D.A.C. in the case of gun ammunition.

The S.A.A. section consists of 21 30-cwt. lorries (15 for S.A.A. and 4 for grenades); the gun section of 31 (15 lorries for 18 pr., 12 for 4·5″ how. and 4 for 3·7″ how.).

The Divisional Ammunition Column (D.A.C.) consists of H.Q. and 4 sections (horsed), three carrying gun and howitzer ammunition for the F.A. Bdes. and the fourth ammunition for the Pack Bde. Its function is to convey ammunition to artillery units when circumstances do not permit the use of lorries of the ammunition company.

Care must be taken to avoid confusion between the titles of ammunition company and the div. ammunition column. The former requires a more distinctive appellation. In no circumstances should it be termed the div. ammunition company.

The Reserve H.T. Co., consists of 59 vehicles (5 for the company, 3 spare and 51 empty L.G.S. wagons) chiefly for use as required in conveying baggage, supplies or ammunition where the ground is unsuitable for M.T. vehicles. These vehicles have the necessary capacity to carry the supplies and forage (less hay) of three infantry brigades, or a weight of approximately 40 tons.

Having thoroughly grasped the general organisation, the next step is to study the detailed arrangements within the division.

Supplies.

Let us first consider the procedure within a unit. Each unit indents daily on A.B. 55 for the number of rations and forage required, 2 or 3 days' notice as may be ordered being given. This A.B. 55 is passed to the supply officer of the infantry brigade or divisional troops as the case may be. Each supply officer consolidates the various A.B. 55 submitted, hands them to the senior supply officer of the division who consolidates on one form and passes them to the supply officer of the maintenance company for transmission to the railhead supply officer. The latter notifies his superior departmental authorities who notify the base supply depot concerned.

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The supply depot loads up the approximate required amount of rations for each division into the trucks allotted. The trucks for all formations are sent up from the depot to the "Regulating Station" where they are sorted out and, together with post trucks, trucks from ordnance depots, etc., are made up into trains for the different formations. Each group of trucks for a division or corps troops is called a "Section."

One train usually provides for 2 divisions, or for 1 division and corps troops, i.e. is composed of two sections.

On arrival of the supply train at the allotted railhead, the railhead supply officer, who has a railhead supply detachment under him, checks the train to see that all trucks have arrived and are properly sealed. He then issues the supplies to the supply officer of the maintenance company, usually in groups, one for each infantry brigade and one for divisional troops. If there is a surplus over it is taken into the R.S.O's dump at railhead. The maintenance company vehicles, which have been waiting in some conveniently situated and concealed area, load up the supplies, usually by groups, ie., infantry brigades and div. troops. Each vehicle when loaded proceeds independently to a concealed area (or as may be ordered). Thence the section eventually moves either that day or the next morning, as ordered, to a rendezvous which is fixed by the corps and notified to the division together with expected time of arrival. The division meanwhile decides where the supplies will be taken over by the supply vehicles of the train. This place is called the supply refilling point or S.R.P. If circumstances require it, there may be several S.R.P's. The maintenance company vehicles are met at the rendezvous at the appointed time and guided to the S.R.P. where they dump their loads and return to the corps area. The S.R.P. itself is usually a stretch of road off a main thoroughfare concealed from hostile observation and providing a suitable traffic circuit to enable lorries after unloading or loading up to move off without having to turn round. It should also be situated so as to obviate any uneconomical running of lorries, i.e., the closer it is to the area where the div. train empty lorries are waiting, the better. The supplies having been dumped and the maintenance lorries departed the div. train supply sections proceed at the time or times ordered and by the routes laid down

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by Div. H.Q., to the S.R.P., and load up in detail, i.e., by units. After loading they move off to a concealed area as ordered by Div. H.Q. and wait there until the time comes for conveyance of the supplies to units. Division H.Q. meanwhile have been watching the situation and as soon as possible fix certain meeting points for the supply section of each brigade and of divisional troops and notify these to formations concerned and the time of arrival, repeating these instructions to the train through the O.C., R.A.S.C., of the division, together with the routes by which the lorries are to proceed. These meeting points must be sufficiently far in rear of the formations concerned to enable the lorries to move forward to the delivery points which are usually in the vicinity of the transport lines or wherever the travelling kitchens, water carts and mess carts, etc., of units may be. Formations arrange for guides from units to meet their lorries at these meeting points and guide them straight to the delivery points.[1] It must be remembered that if meeting points are fixed too far in rear, unit guides may in certain circumstances have to go quite a long distance to reach the meeting points. It may therefore be preferable for Div. H.Q. to fix a brigade meeting point and for the brigade to fix the unit meeting points. This is useful if the situation is not sufficiently clear when orders must be issued for the move of the lorries. It is easier in such circumstances to lay down a brigade meeting point well to the rear, and the brigade will have more time in which to fix meeting points conveniently situated for units. On arrival at delivery points, lorries unload and return by such routes as ordered by Div. H.Q., to the area allotted to them for billets where they remain until the time comes for the procedure to be repeated next day.

As a rough guide the normal radius of each mechanical transport link may be taken as 25 miles. The maintenance company and the div. train have thus a working radius of 50 miles from railhead. If the distance between railhead and delivery points is less than 25 miles, one link can be cut out; in other words the div. train vehicles draw direct from railhead and the maintenance company supply section is not required. (See below.)

[1] It should be noted that mounted guides are of little use in guiding a lorry If mounted men only are available and the distance is too far for a man on foot two should be sent, one to go on the lorry and the other to take the horses back.

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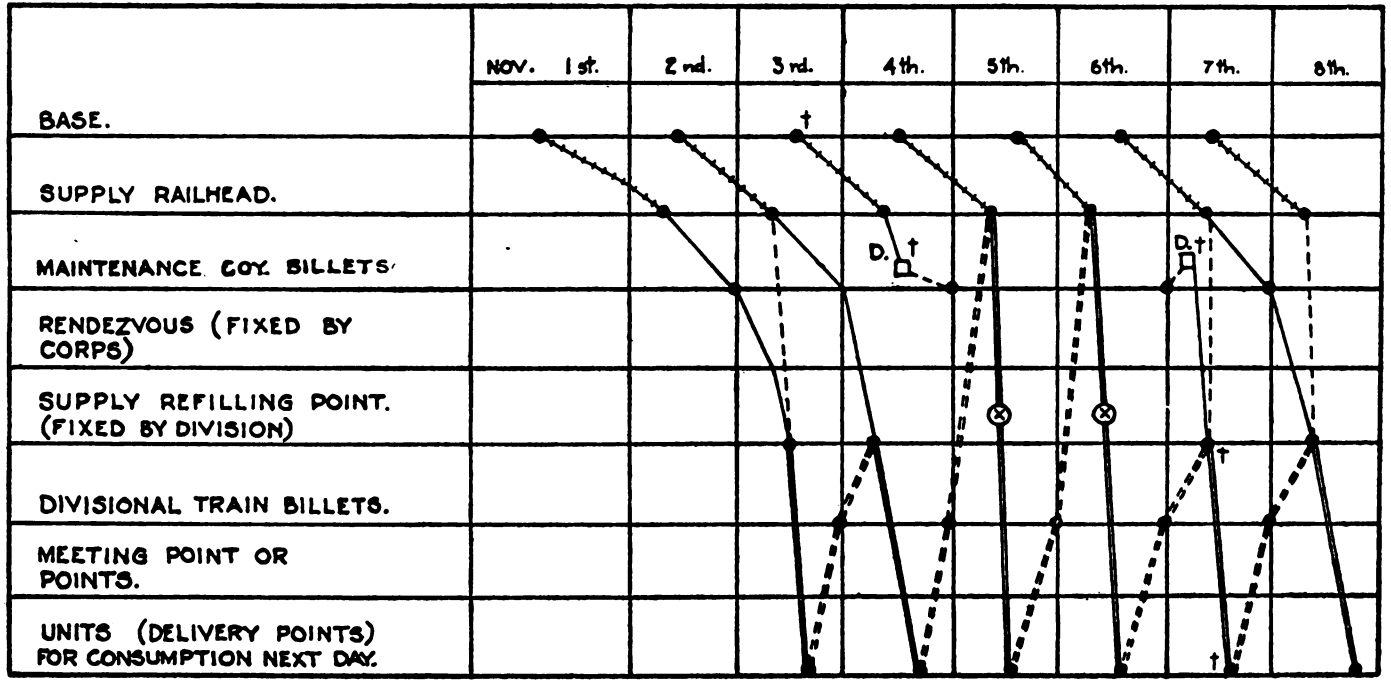
—SUPPLIES.—

Appendix I.



RAIL — — — — — ++++++++++++

MAINTENANCE COY. SUPPLY SECTION. } FULL. ———— EMPTY. - - - - - - - - - - -

DIVISIONAL TRAIN SUPPLY SECTIONS. } FULL. ═══ EMPTY. ▪▪▪▪▪▪▪▪▪▪▪

DUMP — — — — — D.

BREAK BULK AND RELOAD IN DETAIL } — — — ⊗

HARD RATIONS. — — — †

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Diagram App. I gives the supply system in graphic form. As stated above it may be possible, owing to a short radius, for the div. train to draw supplies direct from railhead and for the supply section of the maintenance company to be cut out. App. I gives an example of how the change is made.

An examination of the graph shows that the supplies loaded up at the base on the 1st November reach the troops on the evening of the 3rd and are consumed on the 4th, and that on each day, after supplies are drawn from railhead, there are 2 days' supplies between railhead and the units (one with the maintenance company and one with the train) exclusive of the current day's rations with the troops. If the div. train draws direct from railhead instead of from the maintenance company, something must be done with the supplies which the maintenance company would normally have handed over to the div. train. They cannot be handed over to the train which is already dealing with its one day's supplies. Therefore these supplies must be carried by the maintenance company or dumped until the company is required to be interpolated again. Usually they are dumped so that the vehicles of the supply section of the maintenance company may be available for other purposes. Fresh meat and bread cannot be carried or dumped for an indefinite period, therefore arrangements must be made with the base to send up hard rations (preserved meat and biscuit and groceries) which will keep for any period. For example, in the graph it is assumed that on the 5th the div. train will draw direct from railhead. In the normal course the div. train on the 5th would have taken over from the maintenance company the supplies which arrived at railhead on the 4th. These supplies will, however, not now be required and must be carried by the maintenance company or dumped. The supplies arriving on the 4th must therefore be hard rations and the base must be told in sufficient time on the 3rd to load up hard rations. The maintenance company draws these supplies on the 4th and dumps them at some convenient locality.

On the 5th the div. train draws direct from railhead and will usually have to load up exactly as the maintenance company did, i.e., in bulk by groups. This means that after leaving railhead the supplies will have to be dumped at some intermediate spot and reloaded in detail, i.e., by units. It is important to bear in mind

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that if this procedure of the div. train drawing direct is adopted in moving warfare for long, especially in the summer, there is likely to be a considerable extra strain thrown on drivers and vehicles of the train. Supply vehicles frequently cannot be sent up to units until after dark and thus may not be unloaded and clear of units until after midnight. If they have to draw at railhead early next morning, as is usually the case, the drivers will have little time to rest. It is true that there are about 50% spare drivers in a div. train but it must be also remembered that vehicles require rest almost as much as drivers. This point is apt to be overlooked. Again it must be remembered that in moving warfare supplies cannot always be sent up to units until the current day's rations have been consumed by units, since the transport of a battalion cannot on the existing scale carry any more than one day's rations.

When it is desired to interpolate the maintenance company again, e.g., on 7th (vide App. I), the hard rations which were dumped on the 4th are picked up by the maintenance company and taken to S.R.P. The maintenance company then draws from railhead and the ordinary procedure is resumed.

From the graph in App. I it will be seen that the normal daily supply situation is:—

One day's supplies being loaded up at base.
One day's supplies arriving at railhead.
One day's supplies between railhead and unit.
One days' supplies being consumed by unit.

Ammunition.

Ammunition supply differs from the supply of food in that the latter is required daily in a more or less regular quantity, whereas the demands for the former are spasmodic and vary according to circumstances.

Train loads of ammunition are loaded up at the base ammunition depot as ordered by G.H.Q., proceed to the station allotted as ammunition railhead (A.R.H.). Here the ammunition is loaded up into the lorries of the maintenance company (ammunition sec.) and taken as in the case of supplies to a rendezvous fixed by the corps staff. The division arranges for the lorries to be met there and guided to the ammunition refilling point (A.R.P.). The

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requirements of an A.R.P. are much the same as a S.R.P.—concealment from hostile view, adequate room and good road circuits, approaches and exits.

From the A.R.P. ammunition is conveyed by the ammunition company of the division :—

(i) S.A.A. and grenades to the infantry brigade S.A.A. reserves, if formed, or the battalion S.A.A. reserves if no brigade reserve is formed.

(ii) Artillery ammunition to the wagon lines or even gun positions. Where it is not possible for the lorries of the ammunition company to convey the ammunition straight up to the wagon lines or gun positions, the horse drawn vehicles of the div. ammunition column are used as an intermediate link.

The links between the A.R.P. and the firing line are thus :—

A. In the case of S.A.A. and grenades.

(a) The S.A.A. section of the ammunition company of the division.

(b) The infantry brigade S.A.A. reserves.

(c) The battalion S.A.A. reserves.

An infantry brigade S.A.A. reserve is normally formed by detaching from each battalion one or more of its S.A.A., L.G.S. wagons as the brigade commander may order. An officer is detailed to command this reserve. His first duty is to notify the O.C., S.A.A. section of the ammunition company that a brigade reserve has been formed and his position. The O.C., S.A.A. section is responsible for maintaining touch with the O.C., brigade reserve and sends forward a motor cyclist to remain with it. This motor cyclist is used to take back demands for ammunition and to act as a guide for the vehicles bringing up replenishments. Div. H.Q. also usually notifies in orders or by message to infantry brigades the position or positions (advanced rendezvous) where lorries of the S.A.A. section will be found.

B. In the case of artillery ammunition :—

(a) The gun section of the ammunition company of the division.

(b) The div. ammunition column.

(c) Battery wagons.

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A point to note with regard to the artillery ammunition is that whenever possible the lorries of the ammunition company should deliver direct to the wagon lines or even gun positions. This will save time and also double handling of ammunition. The ammunition company, however, is a R.A.S.C. unit and it is necessary to make it quite clear who is the deciding authority as to whether the H.T. vehicles of the D.A.C. are to be used or not. It is considered that the O.C., D.A.C., should decide this point. This must be borne in mind in settling the position of the D.A.C., which should be so located that lorries proceeding to fill up a battery should either have to pass the D.A.C., or some point near by where the necessary instructions can easily be given.[1] If this is impracticable the O.C., D.A.C., must establish himself at some place on the up traffic route which all full lorries must pass and whence they can be directed either to wagon lines or to the D.A.C. vehicles. The O.C. of the gun section of the ammunition company should during an action be with the O.C., D.A.C. The former has 10 motor cycles in his section. These will be of great help in maintaining touch with the artillery wagon lines, etc., and as the lorries arrive from A.R.P. they can be ordered either direct to the wagon lines, or to any section of the D.A.C. if the wagon lines cannot be reached by M.T. Another point to be settled is the location of the H.Q. ammunition company. It is considered that normally this should be at the A.R.P. and the O.C., Co. will be the O.C., A.R.P. and will be responsible that full use is made of the local conditions for concealment and that all arrangements are made for the rapid and smooth despatch of all ammunition to the front. He will receive his orders for the establishment of an A.R.P. from Div. H.Q., through the O.C., R.A.S.C., of the division.

It must also be remembered that whilst the D.A.C. holds both boxed and unboxed ammunition the ammunition company carries only boxed ammunition.

Appendix II gives the chain of ammunition in graphic form. The working radius from railhead of the road links is the same as in the case of supplies, i.e., approximately 50 miles, 25 miles for each M.T. link.

[1] This point must be remembered in deciding the direction of one-way traffic routes.

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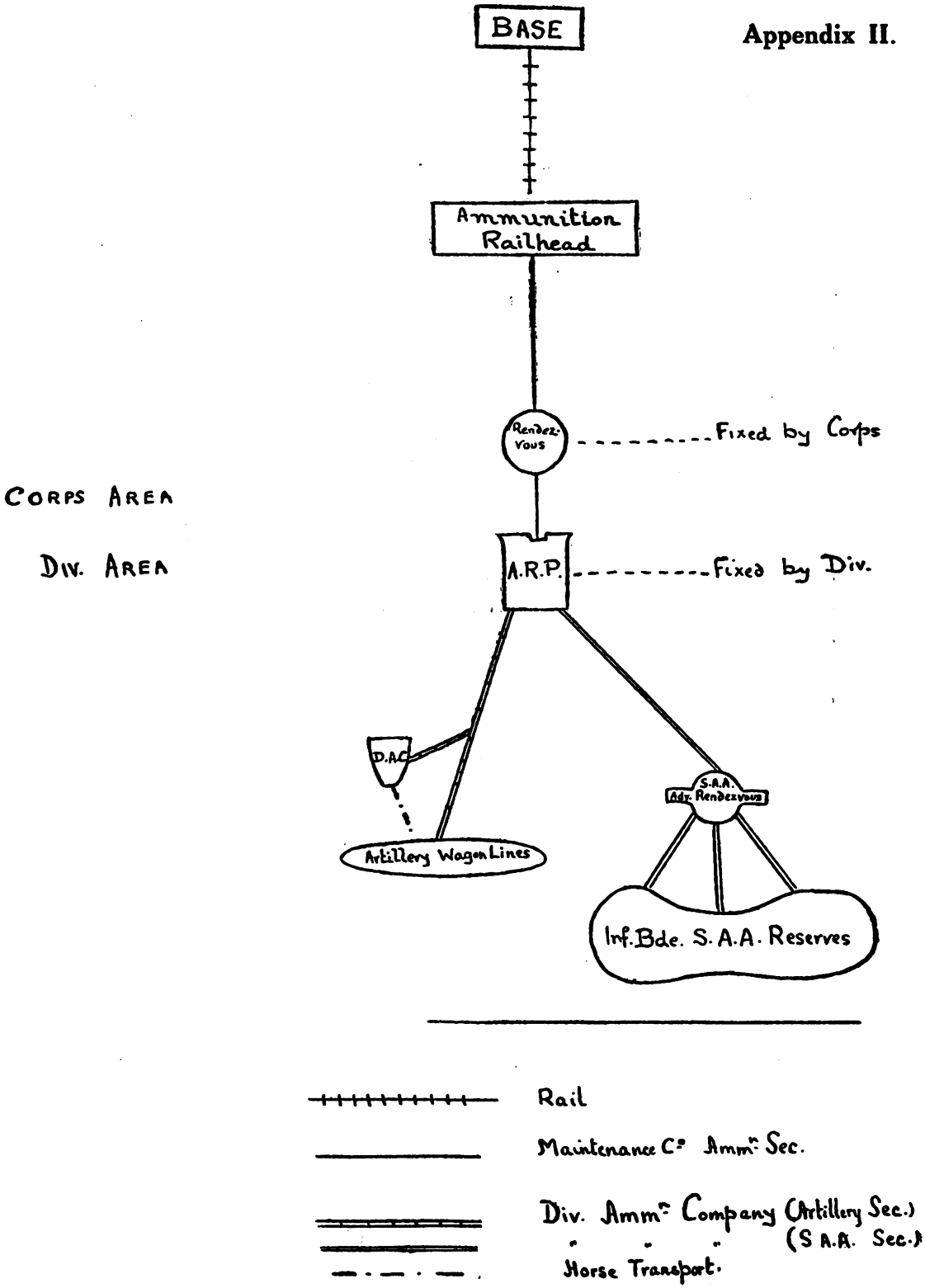
Appendix II.



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Ordnance Stores.

The R.A.O.C., organisation within a division consists of the D.A.D.O.S., at Div. H.Q., and his staff of 5 other ranks.

Units requiring any ordnance stores indent on the D.A.D.O.S., of the division. The latter notifies the base by wire, or letter, according to circumstances. Stores, etc., are then sent up to the supply railhead of the division. Four lorries of the maintenance company are available for the conveyance of ordnance stores to the division. Any additional transport required is asked for by the D.A.D.O.S., from the division "Q". At present no lorries are allowed for in the train for ordnance stores.

When possible the D.A.D.O.S., maintains at Div. H.Q. a small reserve of stores such as rifle oil, flannelette and socks.

R.E. Stores.

The C.R.E., demands on the corps, or the base, as may be ordered. Small items can be sent up in a similar manner to ordnance stores. Two lorries in the maintenance company are earmarked for the conveyance of R.E. stores. Special arrangements will have to be made for the conveyance of bulky stores, or for large quantities. In certain cases dumps of R.E. stores may have to be formed alongside railway sidings definitely allotted for this purpose and usually under corps or army control. Divisional requirements would be drawn from these dumps, arrangements for transport being made by the staffs concerned.

Medical.

The medical organisation within a division consists of :—

(a) Medical establishments with units.

(i) H.Q. Div.
The A.D.M.S. and D.A.D.M.S. and clerks. The A.D.M.S. is the technical adviser of the G.O.C. on all medical and sanitary matters affecting the division and is responsible for all medical and sanitary arrangements. He is the commander of the medical units. His assistant, the D.A.D.M.S., is also sanitary officer of the division.

(ii) Each artillery bde. and D.A.C.
Medical officer and 2 orderlies. Personnel for

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sanitary and water duties and 1 Maltese cart. (1 pack mule in addition in each pack battery.)

(iii) Each infantry battalion.
Medical officer, 2 orderlies and 22 stretcher bearers. (6 in H.Q. Wing and 4 per Co.) 1 Maltese cart. (Pioneers perform sanitary and water duties.)

(iv) Div. Train.
Medical officer. Sanitary and water personnel. 1 motor van.

NOTE.—In (ii), (iii) and (iv) the other ranks are provided by the unit concerned.

(b) Sanitary Section. 1 Officer and 27 O.R.—9 bicycles, 2 vans 1 lorry disinfector. Usually located close to Div. H.Q. Its duties are :—

(i) Giving technical advice to units with regard to sanitary arrangements generally.

(ii) Assisting units in construction of sanitary conveniences, viz. : incinerators, latrine sites, removal and destruction of excreta and waste products.

(iii) Disinfection of billets, clothing, equipment, etc., which have been exposed to infection.

(iv) Supervision, protection and purification of water supplies.

(v) Sanitary police duties. (F.S.R. 1.)

(c) Field Ambulances. 3 per division.

A Field Ambulance consists of H.Q. and 2 companies. Normal capacity 150 patients but not necessarily limited to this number.

The H.Q. includes sanitary and water personnel, a hospital cook and 36 privates, also dental establishment attached. Five H.T. vehicles, 9 M.T. vehicles (6 light, 2 heavy ambulances and 1 3-ton lorry).

Each company consists of 3 officers and 50 O.R., 4 riding and 16 L.D. horses, 6 H.T. vehicles (2 heavy ambulances, 1 water cart and 3 L.G.S.).

It will be noted that the H.Q. has the disadvantage of possessing both M.T. vehicles and H.T. vehicles, a point to be remembered when orders for a march are being drawn up.

App. III gives the chain of the medical organisation when in

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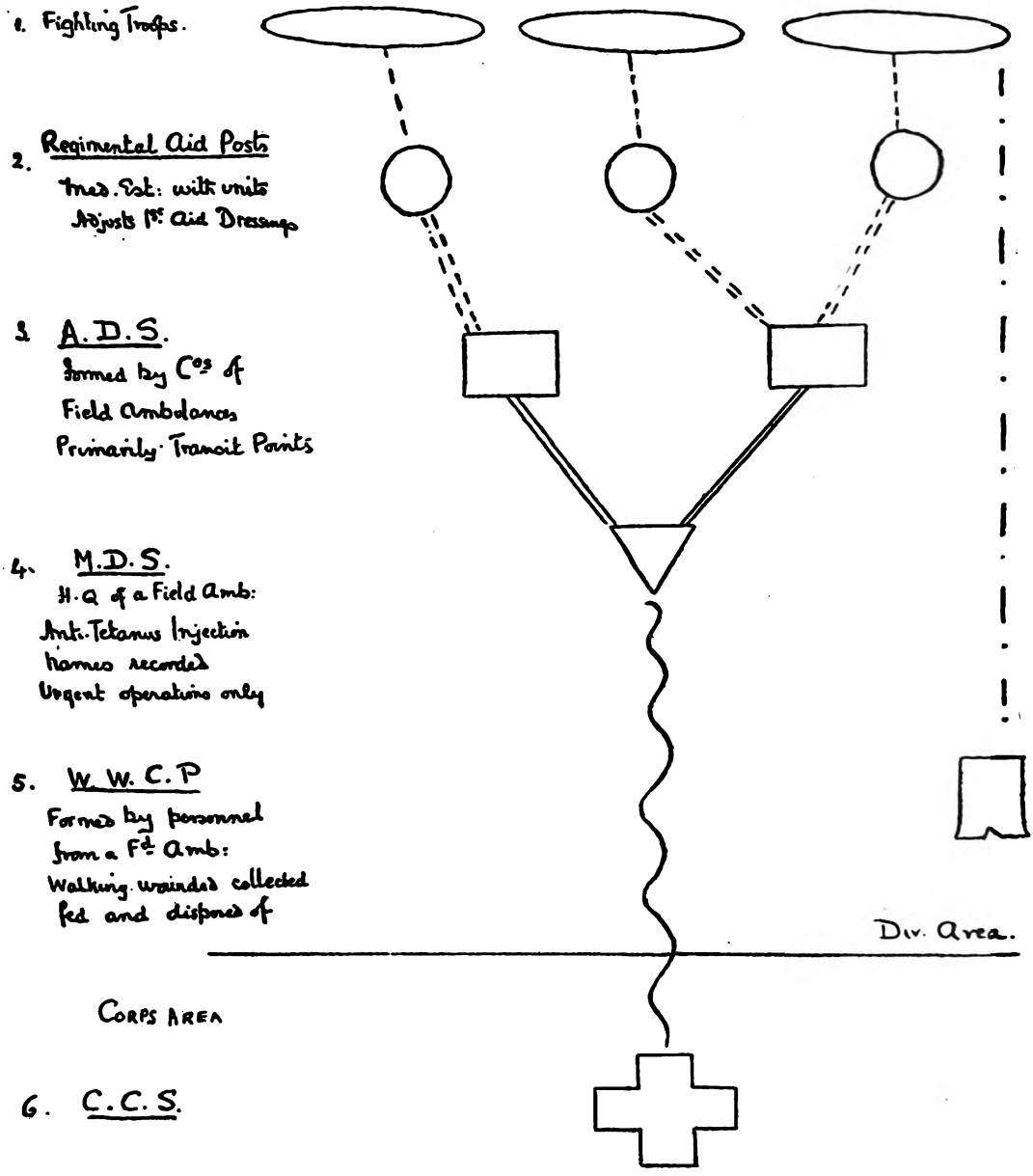
Medical Organisation.

Appendix III.



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action—Regimental aid posts are formed by medical personnel with units in the most suitable and convenient spot having due regard to cover, protection and accessibility.

Casualties in the front line are carried back to the aid post by the unit stretcher bearers who, when an action is imminent, are placed under the orders of the M.O. of the unit. Here first aid dressings are adjusted and field medical cards are made out.

From the aid posts wounded are removed by the stretcher bearers of the field ambulance companies with the assistance of the 2 horsed ambulances, if necessary, to the advanced dressing station. An A.D.S., is formed by one or both companies of a field ambulance. The position of an A.D.S., is ordered as a rule by Div. H.Q. (A.D.M.S. in consultation with the staff). In certain circumstances, however, a field ambulance or a company of a F.A. may be attached to an infantry brigade, the commander of which would then issue the instruction as to location and opening of an A.D.S., after consultation with the field ambulance commander or the O.C., company. At an A.D.S. all that can usually be done is to give temporary shelter and provide refreshments to the wounded and urgent surgical treatment only, to ensure the thorough protection of wounds and injuries from dirt or further damage during transit. If possible field medical cards not already made out are fixed.

The requirements of an A.D.S. are :—

Protection from enemy.
If possible in a building, with good road access.
Water supply.
Capable of expansion.
As far forward as possible to reduce the work of stretcher bearers.

The A.D.S., is primarily a transit point and it will not always be possible to establish a fully organised A.D.S. In such a case some point must be fixed close to a road leading to the main dressing station (M.D.S.), from which point the bearers of a field ambulance can work to clear R.A.P's.

From the A.D.S., casualties are conveyed by ambulance cars and wagons of the field ambulance to the main dressing station. The M.D.S. is established as ordered by Div. H. Q., and is formed

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by the H.Q., of a field ambulance. Its requirements are similar to those of an A.D.S., on a larger scale. At the M.D.S. anti-tetanic injection is given to all wounded and their names are recorded. Urgent surgical operations only are carried out. Casualties are thence evacuated out of the divisional area to the casualty clearing stations (C.C.S.). The transport for this purpose consists of motor ambulance convoys (corps units).

When a severe fight is anticipated, in addition to dressing stations there will usually be established a divisional walking wounded collecting post (W.W.C.P.). The staff for this is found by a field ambulance as ordered by the A.D.M.S. The object of such an establishment is to avoid overcrowding the A.D.S. and M.D.S. and hampering the efforts to deal with the more serious cases. The notification of the W.W.C.P. will usually be made in div. orders and arrangements made by the staff to ensure that stragglers posts and other police direct all walking wounded to the locality selected which should be near, but not on top of, a dressing station, and on or close to a road leading to a C.C.S. Record is made of cases, and field medical cards completed when necessary, anti-tetanic serum injected and light refreshments supplied. The evacuation of the walking wounded is a matter for the div. staff to arrange. The usual difficulty is how to obtain sufficient transport. Supply vehicles are not desirable for hygienic reasons.

The object of recording particulars is to enable men's movements to be traced and the number of casualties to be ascertained and to facilitate the disposal of future claims for disability pensions. The grant of a pension may depend on a man being able to prove that his disability was due to being wounded in action.

A point to be remembered in dealing with the evacuation of wounded is the collection and disposal of their arms and equipment. Divisional arrangements will have to be made for this, e.g., places can be fixed at or in advance of the A.D.S., where arms, etc., can be collected and subsequently removed when opportunities occur.

The main principle in using field ambulances is to retain at least one field ambulance intact at the commencement of an action and so to arrange the subsequent opening or closing of dressing stations that one field ambulance at least is always available in reserve.

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Veterinary.

The Veterinary organisation within a division is :—

At Division H.Q.	a D.A.D.V.S., and clerk.
At Inf. Bde. H.Q.	a sergeant R.A.V.C.
Div. Artillery.	a pool of 4 R.A.V.C. officers, attached to H.Q. Div. artillery for allotment to artillery brigades and div. amm. col. as required, with 1 batman R.A.V.C. each. 1 Sgt. R.A.V.C. for each artillery battery; 4 Sgts. R.A.V.C. to D.A.C.
Div. Mobile Veterinary Section.	1 Officer, 27 O.R. and 28 horses and 1 horsed ambulance.

There are thus 6 R.A.V.C. officers altogether in a division including the D.A.D.V.S. This officer arranges for the veterinary supervision of all units in the division.

The mobile veterinary section relieves units of sick and ineffective animals and disposes of them by evacuating them to veterinary evacuating stations or to the L. of C., as may be ordered.

Postal.

Letters and postal parcels are sent up by the supply train daily and delivered at supply railhead to a railhead post office. Thence they are conveyed by special lorries (convoy post office=2 30-cwt. lorries) attached to the maintenance company and handed over to the div. train at supply refilling point. Three O.R. of the army postal service are attached to the div. train. At the S.R.P., the letters, etc., are distributed to unit supply lorries to unit orderlies detached from units and attached to the train. The letters are then handed over at the points where supplies are delivered to units and outgoing letters received in exchange. Outgoing letters are conveyed to the railhead post office by a reverse process. The postal arrangements within the division are supervised by 4 other ranks with bicycles attached to Div. H.Q., forming a branch field post office.

The above is the normal procedure and is subject to such modifications as circumstances may require.

Baggage.

In describing the organisation of the div. train above it was

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stated that each company of the train consisted of 2 sections—supplies and baggage. When a division is on the march the baggage[1] sections are moved by Div. H.Q., usually by bounds from one concealed area to another. As soon as it is known where the infantry brigades and div. troops will halt for the night, a similar procedure to that used in the case of supplies is followed. The division fixes certain places as brigade or unit meeting points; and issues orders as to the times at which baggage lorries will arrive at these points and the routes which will be followed.

The baggage lorries are met and guided to units as in the case of supplies. Baggage would normally be sent up before the supply lorries, since only a few individuals are concerned in the arrival of the supplies whereas the whole unit cannot settle down until the greatcoats or blankets have been received. In war it will seldom be possible or desirable that baggage lorries after unloading should return to billets in rear. By remaining with units for the night not only are the roads kept clear for the arrival of supplies but in the case of an early or sudden move the baggage can be loaded up at once without having to send back for the lorries and await their arrival. When baggage has been loaded up the following morning, Inf. Brigades, etc., report to Div. H.Q., where their respective lorries are located. Div H.Q. will then give orders as to their subsequent movement repeating the same procedure that night as in the previous evening. Sometimes the tactical situation may be such that it will be impracticable to send up baggage lorries at all. For this reason it may sometimes be necessary for the infantryman to carry a blanket in his pack. The extra weight will have its compensation in an alleviation of the discomfort at night and the knowledge that this alleviation will not depend on the vagaries of a lorry which may or may not be bombed or ditched. When battalion transport is all mechanicalised and is composed of vehicles like the Morris 6-wheelers which can go across almost any country, blankets or greatcoats will accompany "B" echelon[2] transport of a unit and the load on the soldier reduced.

[1] For composition of baggage sections see war establishment, and for lorry loads see F.S. Manuals of units. An infantry battalion has 5 30-cwt. lorries (2 for baggage, officers' kits, etc., and 3 for greatcoats). If blankets are taken additional transport will be required.

[2] This term is usually applied to the administrative vehicles of a unit, e.g. travelling kitchens, water carts and officers' mess carts.

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Provost duties and traffic control.

At Div. H.Q., the D.A.P.M., commands and administers the military police which in a division consist of 1 provost company. It consists of 1 mounted provost section and 2 provost sections. (M.F.P. on bicycles), 1 officer and 46 O.R. and 8 O.R. attached. The attached consist of 3 R.A.S.C. drivers, farrier, batman, cook, carpenter and signwriter. The actual composition of this unit is at present under revision. The present organisation it is understood may be modified by reducing the number of M.M.P. and increasing the number of M.F.P.

The increasing importance of traffic control with the amount of M.T. vehicles (especially supply, ammunition and ambulance vehicles) constantly on the roads, renders it essential to retain as large a proportion of this unit as possible with Div. H.Q. The D.A.P.M., is then in a position to arrange at once for traffic posts, as required, immediately orders for moves of formations, units or vehicles are issued or received by Div. H.Q.

At the same time infantry brigades require some assistance in the way of military police. Div. H.Q. would therefore attach a few M.P. permanently to each infantry brigade as may be considered necessary. Two M.M.P., and 4 M.F.P., to each infantry brigade are usually the minimum required.[1] Div. H.Q., will also instruct infantry brigades as to the limits of the area within which brigades will be responsible for traffic control. An important difficulty which the O.C., provost company has to overcome is the feeding of his men on duty in outlying places. The transport at present allotted is a motor cycle and side car and a light motor van. Food for outlying posts is normally conveyed in the unit transport and distributed to the police posts ready cooked. It is difficult to keep the food hot, especially for posts at any distance.

The police duties chiefly consist in :—

(1) Regulating traffic in vicinity of Div. and Bde. H.Q., having in view the necessity for concealment of H.Q., from the air.

(2) Controlling traffic at cross roads, S.R.P's, A.R.P's in

[1] In detaching M.P. for such duties they should be detailed in pairs, one man on duty and the other resting.

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vicinity of M.D.S., W.W.C.P., and at brigade rendezvous for baggage or supplies.

(3) Finding stragglers' posts—collection and disposal of stragglers and P. of W.

(4) Facilitating passage of cross traffic, e.g., move of a unit across the divisional area.

(5) Maintenance of discipline.

(6) Arrest of unauthorised persons within divisional area.

Whenever practicable the issue of traffic circuit maps and the erection of traffic signs will facilitate traffic control, but they are of little use in rapidly moving warfare. In such cases adequate police posts are far more efficacious. In any case, however carefully traffic circuits may be arranged, circumstances may sometimes require that vehicles will have to proceed against the traffic direction. Such occasions will demand very careful traffic control. All formations must be prepared to improve the road communications in their vicinity to facilitate the passage of lorries, such as making passing places, rounding off sharp corners, making turning places, filling in ditches etc., etc.

Traffic control cannot be carried out successfully without the co-operation of all units or detachments. Road junctions must never be blocked by a column when halted. Passing places must be left by suitable distances being maintained at different places throughout a column both on the move and when halted. Troops especially when moving at night are apt to block road junctions or to close up when halted. The importance of good march discipline cannot be emphasized too much. The success of the operation in progress may depend on the smoothness with which the traffic flows on the roads.

In a study of the foregoing one fact stands prominently out, a fact which is never fully exemplified during peace, viz :— the heavy strain that will be put on roads by the number of vehicles serving the troops. The addition of every unit in a divisional area, tank battalions, corps artillery units, anti-aircraft detachments, R.A.F. vehicles, etc., and the fact that cavalry formations may also have to use the same roads within the area allotted to a division, will increase still more the difficulty of the traffic problem. This problem will be to some extent eased when suitable vehicles are

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introduced which can proceed across country and are independent of roads. During operations it will seldom be possible, except in very enclosed country, to conceal the movements of vehicles during the day. An active enemy can cause considerable dislocation by judicious bombing of roads. Unless the enemy is considerably inferior in aircraft he will be a bold man who will guarantee supplies reaching a unit according to plan if vehicles are dependent on roads. It would seem, therefore, that until some means can be contrived to feed an army such as enabled the Israelites to be supplied during the Exodus from Egypt, or suitable transport is introduced, a good deal of dependence will have to be placed on the iron ration carried on the person and this ration will have to be continually replaced. Hard rations, as opposed to fresh meat and bread, would in fact appear to be the most suitable for daily issue when fighting is intense and the men must be taught how to make the most of it. Experientia docebit.

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WAR EXHAUSTION.

By Major (temp. Lt.-Col.) W. G. Lindsell, d.s.o., o.b.e., m.c., *p.s.c.*, R.A.

IN Field Service Regulations we read as follows:—"War can be brought to a successful conclusion only by the defeat of the enemy's armed forces and the destruction of his power of resistance. The object to be aimed at in designing an Imperial Army is to produce an organisation which can achieve this result in the minimum of time, with the minimum expenditure of men, money and material. One of the basic principles of war organisation is to economise military force by utilising to the greatest extent possible the ordinary machinery of civil life to assist the forces in the field."

The art of war is to expend our enemy's resources while conserving our own. Strategically, tactically and administratively we must apply the principle of economy of force so as to prevent war exhaustion in our own nation while compelling it in that of the enemy.

War of the continental type is no longer the affair of the fighting services alone, every department of state, every man and woman is affected. Every citizen must be prepared to play his or her part in the defence of the nation's vital interests; as soldiers we endeavour to do this by the destruction of the enemy's powers of resistance; as responsible officers we should endeavour to educate our civilian brothers in their duties in this connection, so that our national machinery may be so organised as best to conserve our military resources.

It would hardly be possible, short of a book of many pages, to give a comprehensive list of the items which can legitimately be classed as war material. Such a list would vary from the obvious items like guns and ammunition to the less obvious, though possibly vital, commodities such as jute and shellac which can only be obtained in bulk from India.

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Of all the requirements of war manpower is the first and most important, even when we arrive at the days of the death ray we shall require men to make the appliances, or produce the plant and power for its manufacture and projection. The exhaustion of manpower is therefore our first consideration, but the exhaustion of material is a very good second, as men alone without the means of feeding and fighting would not go far towards winning the war.

We need to organise our manpower in peace and to conserve it in war; similarly we must organise and protect our material resources so as to prevent their premature exhaustion in war. Men and material are both essential but without a determination to win in the civil population as a whole, the big wars of the future will not be brought to a successful conclusion. The tendency of modern war is to bring the importance of this last factor into greater prominence that ever before.

In considering the problems of war exhaustion in their application to continental wars of the first magnitude there are therefore these three main factors to be dealt with :—

(a) Exhaustion of manpower.

(b) Exhaustion of war material.

(c) Exhaustion of the determination of the civil authorities.

Each of these headings will now be discussed in turn in the light of the more recent requirements of modern warfare.

Unlike the great continental nations with their compulsory service systems we have no general registration of our manpower. We do not really know the numbers and distribution of our available resources of men physically fit to fight. Still less can we readily lay our hands in time of need on the very large numbers of skilled tradesmen of innumerable grades and types required for the maintenance of our armies. Short of a change in our national psychology and of our constitutional laws it is hard to see how this difficulty can be overcome. At the beginning of the Great War and indeed at all stages during it our first need was men, and we have every right to congratulate ourselves on the magnificent response of the nation to the first calls for volunteers to fight. On 6th August, 1914, 100,000 men were asked for, by the 25th August this number had been practically secured. Although the total had to be multiplied eventually by ninety the response of the nation was

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really magnificent. The very magnificence of this response was, however, partly the cause of our subsequent difficulties as regards manpower, especially in connection with munitions supplies. The skilled employees of the armament firms and likewise of the building and allied trades enlisted in large numbers. The result of this was to reduce the munitions output by about half what had been anticipated, and to make it impossible to start on the necessary extensions of the firms' premises.

If we consider the situation at the beginning of the war, we find the recruiting officers under the orders of the Adjutant General, making every effort throughout the country to enlist men to serve with the colours. While similar organisations were at work recruiting for the Navy and the Royal Flying Corps, as it then was, the Master General of the Ordnance was applying to the Board of Trade for skilled workmen required for munitions production, while the Board of Trade was primarily concerned in the maintenance of the country's commercial enterprise so that our export trade should be in a position to maintain our credit overseas. Men were required for the fighting forces and for munitions work, to maintain them, industry in turn had to be kept going. No authority existed, until the Military Service Act was passed, under which our manpower could be controlled or directed into the channel most essential for the country's need. The various agencies at work were in many ways competing with one another, and thereby adding to the nation's difficulties, and no man could be compelled to serve with the colours or to work at munitions provision. The only way to deal with the situation was to have one authority dealing with the provision of personnel to meet all the nation's needs whether for Navy, Army, Air Force or industry.

The lesson is that for a war on a grand continental scale we must have a National Service Act, and still more in peace do we require a National Registration Act, without which we have no means of gauging the nation's potentialities in skilled workers of any grade or of knowing where we can lay hands on them in time of need.

Whether or not the nation is prepared to accept legislation to this end is not for the soldier to say, but one thing is clear that for a great war we must have government control of labour and its

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movements, and just as before the war Lord Roberts preached National Service, so should every soldier to-day preach National Registration.

So much for the question of provision of manpower, it is a problem primarily for the statesman. As soldiers we are more directly concerned in preventing the wastage in war of the manpower placed at our disposal by the efforts of the Adjutant General's department.

In battle we aim at reducing our casualties from the enemy's shells and bullets by adopting the most suitable tactics, and by improving the co-operation of all arms so that we can attain our object with the minimum of losses. In peace, too, we study the principles of sanitation and hygiene so that we can apply them in the field to the prevention of casualties from disease, which in the past have proved such a serious drain on our armies in war. In future, as the result of our experiences in the Great War, we must study the causes and means of prevention of psycho-neurosis, more commonly, if erroneously, called shell shock, as this disease was responsible for very serious wastage of manpower in the last war.

Our actual losses from psycho-neurosis during the war were certainly very heavy. At the time of the Armistice no less than 65,000 soldiers were in receipt of pension from this cause alone. Of the total number of cases of psycho-neurosis which occurred it was calculated that ninety per cent. were not due to actual shock of shell explosion or physical wounds, but were due to a mental state brought about in the individual by the conditions of existence and prolonged strain to which they had been subjected under the circumstances of modern war as we knew it between 1914 and 1918.

In addition to the numbers who were actually evacuated from this cause there must have been many whose fighting efficiency was considerably impaired although they may not have reported sick. Here then is a very definite form of war exhaustion and it is one which all officers can do a very great deal to minimise and prevent.

Since the war this disease has been the subject of close inquiry and the "Report of the War Office Committee on Shell Shock" contains a lot of most interesting evidence from commanding officers, staff officers and medical officers which will well repay the time taken in reading it. The burden of the conclusions come to

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by this committee may be very briefly summarised, for purposes of this article as follows :—

(a) Psycho-neurosis is a definite disease, which in certain circumstances is contagious, resulting possibly in panic or in desertion to the enemy in serious proportions.

(b) High morale and good leadership undoubtedly tend to lessen the condition if not to prevent it altogether.

When discipline is bad you get desertion, where there is no *esprit de corps* you get cowardice, where you have a high standard of *esprit de corps* and discipline you do not find these things and you get very little shell shock.

(c) To prevent psycho-neurosis, therefore, we must first of all promote good morale and back this up by good interior economy and good administration in units. When the conditions of active service admit, good food, rest, exercise, baths, clean clothes, entertainments and leave, are potent factors in preventing psycho-neurosis. Good sanitation and the physical comfort of the men must have our constant attention as they very considerably affect the incidence of shell shock.

(d) Though a good regimental medical officer is of the highest possible value in this connection, it is the unit regimental officer who really tells and who can do most to prevent war exhaustion from this cause.

It must however be realised that the requirements of modern war are nations in arms, and as our expansion for war increases the recruiting net is cast wider and wider. We must then take in a type of man whom we would reject for military service in normal times. It is then that this question of psycho-neurosis assumes serious proportions. We should be able to eliminate it entirely with a highly trained voluntarily recruited peace time army.

Let us turn now to the second heading—the exhaustion of War Material. No country in the world is entirely self-supporting as regards all its raw material for war. The United States are probably better off than most, but even in their case there is quite a formidable list of items to be obtained from other countries. What we have to consider is how we are going to prevent the exhaustion in

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war of our essential material needs and how we can best turn the question of the war exhaustion of an enemy's material resources to our own advantage.

The answer to the second question is found in the application of the blockade, of which no better example can be quoted than the blockade of the Central Powers during the Great War. There are of course many serious difficulties in applying a blockade effectively. Difficulties arising out of the rights and privileges of neutrals, which will often present most delicate and complicated problems in international diplomacy. But the war taught us how vital the supply of such things as cotton, nitre, fats, rubber and such-like commercial items are to a nation engaged in war, and the weapon of the blockade is one that we as a nation cannot afford to dispense with in a continental war.

The solution of the problem of how to prevent exhaustion of our own raw materials is much more difficult. The two outstanding factors in this connection are finance and time. Finance which precludes the holding of vast reserves in peace against possible war eventualities. Time since, when mobilisation is ordered, large stocks of every kind of need are called for faster than they can possibly be produced or imported from outside. As an example in connection with the time factor it is interesting to note that one item which seriously delayed the equipment of our new armies in 1914, was a complete failure of the trade to supply sufficient buttons !

As regards reserves held in peace in preparation for mobilisation. The end of the last war found us in possession of vast quantities of war material of all sorts. Much of this material was of course part worn or actually worn out from use, much of it again was obsolescent; but after deducting the worn out and the obsolete there was probably enough left to equip an army of the 1918 scale with thoroughly efficient material and something over for future maintenance purposes. At first sight a very satisfactory state of affairs, we could reduce our army to peace time dimensions while still retaining the munitions equipment to expand again to 70 divisions. But difficulties at once arose. There was no storage space available to hold even a fraction of this vast accumulation; many types of stores rapidly deteriorate if held too long in stock; enormous numbers of men would be required as caretakers to look

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after this equipment and prevent deterioration. Here finance steps in. The urgent cry for economy made the building of storage accommodation and the provision of caretakers out of the question. There was nothing for it but to scrap vast quantities of potential war reserves. In consequence we are no longer in a position to send a vast army to take part in a continental war, the munitions supply for such an army will again take months to organise and reach a stage of mass production.

Finance then prevents adequate peace time provision against exhaustion of our material resources in war, and time is the chief obstacle to overcome in creating the necessary reserves when war has begun.

There is however a great deal that can be done in peace to clear away the difficulties of war. Firstly by experiment, research and standardisation we can find the most suitable weapons. We can work out our designs and specifications, and with war experience to help us we can calculate what our probable requirements will be both for immediate supply and for continued maintenance. In this way one of the great difficulties of 1914 in connection with provision, can be overcome. Then, in the kaleidoscopic changes which were continually taking place, it was impossible to lay down any satisfactory programme of supply, or to form any reliable estimate of what the army's requirements might be in say six months' time. Now we know, or we think we know, what they will be whether for a small war or for a war of the first magnitude, and this is a most important step towards its provision.

The possibility of procuring bulk output at short notice can in the nature of things only be satisfied in very exceptional circumstances. The average interval which must elapse between the formulation of demand and its satisfaction must be taken in the light of war experience as nearer six than three months. While to organise a new industry and to attain a scale of mass production therein must take at least a year. If one follows back the course of production from the finished article to its component parts and from these to the raw material used in their manufacture, including also subsidiary programmes concerned with the provision of material such as machine tools and plant, considering too the transportation and labour problems involved, it will be seen what a

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difficult task the making of a programme of supply becomes. Unpunctuality of delivery at any stage in the programme may throw the whole process out of gear.

There is little doubt that industry will respond most nobly to the call when it is made in the day of the country's need, but industry will expect the soldier to state clearly what his requirements are. We must be ready with our plans and specifications, drawings made and dies cut. We must take industry into our confidence in peace and encourage it to produce for peace time commercial use what we require for military service in war. Though we are very far from being self-supporting in this country we are very nearly self-supporting within the Empire and this aspect of the war problem needs consideration and further development. This is not purely a matter for the civilian and the politician, the fighting services must give voice to their needs, we must ask for what we want and keep on asking, for in proportion as this provision is not made will future generations groan under still heavier taxation after the next war.

It will be as well to consider at this stage how the problem of war exhaustion is affected by the mechanicalisation which is gradually being applied to the army to-day.

All the leading nations are now busy mechanicalising their armies and most of them have or are thinking of starting tanks. Could we not as an industrial and commercial nation aim at becoming the suppliers of tanks to the smaller nations and thus establish a peace time industry which could be developed in time of war to meet the requirements of our army? The existence of such an industry would prove of the highest war time value to any country possessing it.

To take another item; the 30-cwt. lorry carries approximately the same load as the old G.S. wagon; both require one man to drive and look after them; the 30-cwt. lorry has increased speed and radius of action; but the average life of the lorry is two years, personnel for repairs and maintenance are required in the theatre of war on the basis of one man to every three vehicles, and what of personnel for production of new lorries and spare parts? With this mechanicalisation you get increased efficiency but you pay the price in men.

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The mechanicalised armies of the future must be prepared to make extensive replacements of lost and damaged equipment at an early stage in the operations or they will be seriously handicapped in retaining their essential mobility.

We must decide on our military requirements, and we must aim at developing our industrial resources on the lines of these war time needs; this development must keep pace with our application of mechanicalisation to the army, or there will be danger of war exhaustion overtaking us from our very mechanicalisation.

The possibility of chemical warfare presents further problems in connection with war exhaustion.

Most nations, but not all, have agreed not to use gas in war, but we cannot tell yet with whom we may have to fight next. The use of gas may be forced upon us if our enemy first uses it against us. We must remember, too, that gas or the fear of gas is a potent factor in producing shell shock. We can take defensive measures by way of the provision of gas masks for our fighting personnel; and we can organise defensive measures and decontamination parties for our towns and villages which are open to attack with gas from aeroplanes; but offensive organisation is more difficult. We are now as a nation much better off than we were before the war in this respect. Then we had not the means of producing mustard gas or liquid chlorine in bulk, we did not know the German system of obtaining ammonia and nitric acid from atmospheric nitrogen. Now we can manufacture 100 tons of ammonia daily and could soon expand that output to three times that amount. But for war purposes, if gas was to be used, we would need to expand our chemical industry very considerably, we should be compelled to mobilise our chemical engineers and organise the work of our by-product coke ovens. In this respect, as in the others already mentioned, the soldier in peace must study what his possible requirements may be in war, he must be ready to tell industry what these requirements are, and our government organisation must then see that industry can meet the nation's military needs.

It is clear from the few examples quoted that the developments of modern war have made the problem of war exhaustion of much greater importance than it ever was in the past. The whole resources of the nation are now required and the rapidity and

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effectiveness with which industry can be organised to meet the emergency cannot but have an enormous influence upon the issue of the struggle.

The soldiers' peace time duty in connection with industry has been touched upon, also his duty in peace and war in connection with discipline, interior economy and the inculcation of morale as a means of preventing psycho-neurosis. There is another war time duty of considerable importance in connection with the prevention of exhaustion of war material and that is salvage. A good salvage organisation can do much to prevent unnecessary and avoidable waste. If the statistics of the war are studied it will be found that literally millions of pounds sterling were saved by salvage operations. The re-conditioning of abandoned clothing and equipment, the production of by-products from messing and from fat eliminating plants, and the organised clearing of battlefields resulted in truly enormous savings. The loss of equipment by careless soldiers; the dumping of unnecessary quantities of ammunition in places from which it could not readily be collected again or where it would deteriorate; the breakdown of lorries from overloading or bad handling; the loss of horseflesh from bad horse management, are all questions which, if neglected, have a big cumulative effect towards the production of war exhaustion, and they are all matters which can be lessened by care, forethought and energy on the part of staff and regimental officers. Salvage is a question of organisation for its collection, prevention of waste is a matter of discipline.

Painted on walls and houses in the battle areas of France and Belgium may still be seen the words; "What have you salved to-day?" this was a necessary reminder in the days between 1914 and 1918, it will be equally necessary in the next war as one means towards the prevention of war exhaustion.

Coming now to the question of exhaustion of the determination of the civil authorities. General Ironside reminds us in his book on Tannenberg that "Military thought cannot afford to ignore the ordinary feelings of human nature," and he also states that "The great fault of the German General Staff throughout the war was that they placed themselves apart from the German people and ignored their feelings." We must be careful not to make the same

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mistake. The psychology of the British race is such that in time of peace or fancied security they are peculiarly averse to taking any military precautions and are very unwilling to pay the premium necessary as an insurance against the possibilities of war. When once convinced that the real emergency has arisen they come forward magnificently to fight in defence of their country. Modern war is now an affair of nations, and on the European scale future wars will not be brought to an end until all the resources of one side or the other have been exhausted. It is above all necessary, for the successful conclusion of a big war, that the determination to win of the civil population should be maintained.

War weariness of the nation may be brought about by blockade, by unrestricted submarine warfare, by air attack on civil centres of industry, and these forms of warfare are likely to take a more prominent part in future wars than in the past. As soldiers and citizens we have to play our part in preventing the exhaustion of the nation's determination.

Much can be done by way of propaganda now and every day in peace to stimulate the moral of the nation and the nation's pride in its armed forces. Military tournaments, torchlight tattoos, naval reviews and air force pageants are all valuable means to this end. The British Legion, the Boy Scouts, Girl Guides and similar organisations are of the highest possible value in this connection, and it is our duty as soldiers to give them every possible help and encouragement as opportunity offers. The soldier should be continually at work educating his civilian brother in the nation's military needs. National registration is our first requirement, industrial organisation to meet war time necessities is the next.

In preparation for both of these the soldier must play his part as he will be the first and greatest sufferer if exhaustion should overtake us in the next great war.

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THE EVOLUTION OF ARTILLERY IN THE GREAT WAR.

VIII.—ARTILLERY LESSONS OF THE GREAT WAR.

By Major (Bt. Lieut.-Colonel) A. F. Brooke, D.S.O., *p.s.c.*, R.A.

1. General Lessons.

In studying the artillery lessons of the great war care must be exercised lest we should fail to see the forest for the trees. Amongst the multitude of important deductions that may be drawn one stands out in a class entirely by itself, namely the fact that in our pre-war conceptions we had failed to appreciate the true influence of fire power in modern battle. To derive full benefit from this lesson our military outlook of 1914 must be readjusted in two distinct directions:—

(a) The proportion of fire power producing arms must be increased.

(b) The manœuvre of fire power in battle must receive closer study.

The above deductions are no doubt applicable to the forces as a whole, but since artillery is the main fire power producing arm, it is most directly affected. (See Appendix L.) These lessons in themselves appear so self-evident as to require no further investigation, but if we remember the tendency prevalent in times of peace, to seek mobility at the expense of fire power, we shall find sufficient reason for a closer study of this important question.

(a) *Necessity for a proportionate increase in artillery.*

In following out the evolution of artillery during the war we have seen its role in battle change from an accessory to a necessity. We even went so far as to formulate theories relegating the role of the infantry as an accessory to that of the artillery, such as "the artillery captures positions, the infantry occupies them and consolidates them." With the introduction of the tank the pendulum

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readjusted itself, but with the resumption of peaceful conditions has shown a distinct tendency to swing towards our pre-war conceptions. Evolutions carried out during manœuvres, with the impossibility of reproducing the effects of fire power, are bound to result in deceptive deductions. Operations can no doubt be carried out successfully with a deficiency of fire power, but only at the cost of exceptionally heavy casualties. With the very small forces at our disposal can we afford to be extravagant in man power? The war has proved that an adequate provision of fire power is the best antidote to heavy casualty lists. An illustration of this fact is given in Appendix M, which provides comparisons between the increase of artillery and corresponding decrease of casualties in the French army during the great war.

The argument has frequently been put forward that the great increase in artillery during the war was due to the static nature of the operations, and that such an increase was only rendered possible by the existing trench warfare conditions. If we reconsider the events of 1914 we shall, I think, see that it would be more accurate to argue that the conditions of static warfare were originally produced through a deficiency of fire power. The loss of mobility in the operations subsequent to the race for the sea, can be attributed mainly to lack of artillery ammunition, and consequent impossibility to support any further attacks.

The introduction of the tank as a new arm has created a situation necessitating the most careful and well balanced deductions as to its effect on fire power in modern battle. Its introduction during the war coincided with the adoption of new artillery tactics, but the successes gained were mainly attributed to the use of the new arm. Unquestionably the use of tanks in our offensive of 1918 had both a direct effect on the operations through their own action, and an indirect one by rendering the new tactical handling of artillery possible. Yet, if we examine the German offensive operations of 1918 employing somewhat similar artillery tactics without the assistance of tanks, we find that they met with equal tactical successes. The importance that has been attached to the action of the tanks in our offensive of 1918 has, in certain cases, resulted in false impressions being formed as to the artillery power employed in these actions. Opinions have been expressed comparing the

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success obtained by a limited number of tank personnel at Cambrai with the failures of large numbers of artillery men at Ypres. Such statements fail to take into account the fact that the density of artillery employed to support these tank attacks did not vary appreciably from that employed in supporting the infantry attacks, whilst the tactical handling of the artillery was better calculated to meet with success. There can be no doubt of the fact that the introduction of the tank has reduced many of the tasks formerly asked of the artillery, but it has at the same time created new ones in the necessity of providing protection of the tanks themselves. We are still confronted by the same problems of fire and movement but under a different shape.

We may, therefore, accept the fact that the necessity for a proportionate increase in artillery, proved necessary by the war, still holds good. The extent of the increase required is more difficult to estimate. The following figures provide a rough guide as to pre-war and post-war proportions of guns per 1000 rifles:—

	1914.	*1918.*
British	6·3	13
French	4	13
German	6	11·5

War experience, therefore, points to the advisability of approximately doubling the proportion of guns allowed for in 1914. This figure might provide us with a definite guide if it were not for the probable changes in our organisation which may be expected under the gradual process of mechanicalisation. It provides us, however, with a valuable reminder of the tendency of all nations to underestimate in peace the importance of fire power in war.

We must also clearly recognise the fact that fire power cannot be measured only in terms of guns. A proportionate increase in guns without corresponding adequate reserve of ammunition only creates a false impression of the power available, which may easily result in disaster. Difficulties will always exist in maintaining adequate reserves of ammunition in peace. Such reserves produce a heavy financial strain on the nation, they deteriorate, rapidly become obsolete before ever being used and entail difficulties of storage and turnover. A tendency may consequently always be expected to cut down ammunition reserves to the dangerous

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minimum. At the very best such reserves can only cover the first few weeks of the war, and in the subsequent period our fire power becomes directly dependent on the rate of production. Few lessons of the war stand out more clearly than those in connection with the supply of ammunition.

(b) *Closer study of the manœuvres of fire power in battle.*

Assuming that the fire power of an army has been raised to the required standard, it is evident that its application must receive the closest study to ensure the best effect. In many military minds the word "manœuvre" at once produces a mental picture of columns of troops moving like pawns on a chess board, the rapid changes in fire swept belts rendering such movement possible remain nebulous or absent.

The term "manœuvre" was originally applied to the movement of troops when the limited range of fire arms rendered any manœuvre of fire impossible. Fire arms have now grown out of their infancy, and we must apply the term in its broader sense to include both the movement of the actual units composing the force and the rapid changes in the application of the fire power which renders such movement possible. We now insist on a close study of "fire and movement" within the platoon, but do we pay sufficient attention to the subject in the large formations? In a corps or a division the corps or divisional artillery represent the Lewis gun sections of the platoon, their action must consequently be controlled by the commander of these formations in a similar manner to the platoon commander with his Lewis gun sections. The war provides examples of commanders of formations who failed in the proper control of artillery under their command. The tactical employment of the artillery was too often left entirely to the artillery commander to decide. Such questions as the desirability for a preliminary bombardment, the duration or intensity of such bombardments, the degree of neutralisation or destruction required, the general counter-battery policy, etc., are all matters which should be decided by the commander of the force. The artillery commander is there to advise and to ensure that the required power is developed and applied according to the commander's decision.

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The war has consequently accentuated the importance of all commanders and their staffs being thoroughly familiar with the main factors affecting the employment of artillery. Success in war no longer only depends on the successful tactical handling of troops, equal consideration must be given to the tactical application of the fire power supporting them. The above lesson requires special consideration owing to the impossibility of reproducing the effects of fire power in times of peace.

From the foregoing general considerations we must now pass on to examine deductions that may be drawn concerning equipment, organisation and tactics.

2. Lessons affecting artillery equipment.

(a) *Guns.*

The primary deductions to be drawn from the war may be classified under the necessity for an increase in weight, range and standardisation.

The first two of these factors call for few comments, and have been repeatedly proved to be essential to the requirements of modern war. The necessity for standardisation though fully recognised is a matter of great difficulty. No nation can maintain sufficient guns in peace time to cover mobilisation, expansion, and wastage of a great war. It would be false economy and policy, to endeavour to do so. Reserves would hardly be completed before becoming obsolete. It is therefore essential to reduce the number of different equipments to a safe minimum, and to standardise construction as far as possible. The possibilities of mass production must be kept in mind when selecting and deciding new equipments. The present policy of standardisation is well exemplified by our attempts to produce three standard types of carriages to carry the various equipments required with the field army. Whilst experiments carried out with "gun-hows" provide another example of an endeavour to fulfil two requirements with one nature of equipment. There are, however, distinct limits to this process of standardisation, and consequent reduction of types of equipment. We must remember the error committed by the French in 1914 in their endeavour to meet all requirements with their famous 75 gun.

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The happy balance must be found between tactical requirements and constructional possibilities.

(b) *Ammunition.*

The war produced a distinct landmark in the evolution of artillery in the realisation of the fact that the efficiency of ammunition did not solely depend on its destructive power. We have now learnt that neutralising agents such as smoke and gas may equally well, and at times even better, fulfil the requirements of modern war. To profit from this lesson is, however, not an easy matter, we find ourselves faced with the introduction of new types of ammunition which are hard to provide when the requirements of adequate reserves and standardisation have to be considered. Here again a happy balance must be sought between these conflicting lessons of the war.

(c) *Accessories.*

The war has clearly taught us that the full available artillery power can no longer be developed without the assistance of certain scientific accessories such as flash spotting, sound ranging, survey, meteor reports, etc. Circumstances will not always be such as to admit of the full assistance from these accessories, but the fact must be clearly recognised that the degree of efficiency of the artillery support will be directly affected by the possibility of their employment.

Although observation of fire from the air can hardly be considered as an accessory, since it has grown to be a necessity, we may yet conveniently consider it under the present heading. Our present situation, where the eyes of the artillery have been virtually entrusted to a subsidiary branch of another service, stood the test of the last war as far as our own forces are considered. The experiences gained by the French, however, exemplified the serious dangers which may arise from such an arrangement. We have learnt a great deal concerning the co-operation between aircraft and artillery during the last war, but are now confronted with difficult problems of solving the future evolution of aerial observation of artillery fire. If we follow the evolution of ground observation from a distant O.P. we cannot fail to ask ourselves whether a period should not arise when we should go one step further and

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combine control with observation of artillery fire from the air. Up to the present experiments in this direction have not been encouraging, but with improvements in aircraft and methods of intercommunication better results may well be hoped for.

3. Lessons affecting organisation and control.

(a) *Within the Division.*

The war has clearly demonstrated that the requirements in artillery necessary to support a deliberate divisional attack, are on such a scale as to render it neither possible, nor desirable, to provide such a force of artillery as an integral part of a division. The 1914 organisation remains approximately suitable to meet the requirements of the more mobile phase of modern war, provided a suitable backing of artillery reserves exist. One distinctly weak link, however, exists in this organisation owing to the present impossibility of efficiently meeting the requirements known as "close support" fire. Great strides were made during the last war as regards the close co-operation between artillery and infantry, but in its broadest sense the problem still remains unsolved. Two main factors appear to account for this fact :—

(i) Modern horse drawn and unarmoured artillery cannot operate efficiently within the zone swept by hostile small arm fire.

(ii) With our existing means of intercommunication, close co-operation cannot be ensured unless a proportion of guns are maintained in close proximity of the attacking troops.

The solution of the problem must, therefore, be sought either in providing a mechanical means of propulsion for armoured artillery, or by improving our means of intercommunication so as to admit of constant and reliable intercommunication between attacking troops and their supporting artillery.

The introduction of the tank has partially solved the problem, but still presents us with the difficulty of protecting the tank itself. The support provided by stationary artillery will always remain more efficient than that produced on the move. The true solution, therefore, appears to rest in a combination of both methods. Whilst the tank provides a proportion of the close support required

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mainly against hostile small arm weapons, we require to work towards an ideal admitting of the requirements of attacking troops, whether infantry or tanks, being immediately translated into the proper support from the necessary concentration of suitably sited artillery. In the present scientific age this ideal should not remain long beyond our reach.

(b) *Within the corps.*

The large expansion of the artillery during the great war played a distinct part towards increasing the importance of the functions of the corps headquarters. Through a process of trial and error we arrived at certain definite deductions as regards the control of artillery by higher formations. In the first place it was definitely proved that the control of the bulk of both medium and heavy artillery should be vested in the corps headquarters. Similarly we found that the best results could be obtained from the counter-battery organisation by also establishing it at corps headquarters. Finally the fact was repeatedly proved that to obtain the best result from the concentrations of artillery available for an offensive, an organisation must exist for its centralised control through the corps during the preparation for and preliminary stages of the attack. The above deductions are so self evident that it would be unnecessary to refer to them were it not for the tendency to forget them, owing to the lack of opportunities of reproducing them in times of peace.

The co-operation necessary between field and garrison artillery, as exemplified by the close relation between their respective roles within the corps, clearly demonstrated the inadvisability of the then existing division in the regiment. From the point of view of the efficiency of the artillery in future wars, we may well congratulate ourselves that in spite of certain opposition and distinct difficulties, the re-amalgamation of the regiment is now an accomplished fact as a result of this lesson.

(c) *Within the army and G.H.Q.*

The necessity for a strategical reserve of artillery stands out by itself amongst the lessons of the war. This fact was appreciated by all belligerents at an early period. Methods of organisation varied as to details, but by the conclusion of hostilities all of them had provided for a reserve of medium, heavy and super artillery

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at the disposal of the supreme command. The necessity for such reserves remains undisputed, the degree and nature of their mobility only remains debatable. Based on experience gained in the later days of the war, the French appear to favour strategical mobility, by the adoption of wheeled mechanical transport. We, on the other hand, are endeavouring to combine tactical with strategical mobility, through the improvement of track mechanical draught. As the problem of mechanicalisation of the artillery of the division must no doubt soon be faced, the policy we have adopted seems better suited to meet this end.

Our eyes have been opened as to the assistance which railway transport provides artillery in war. The vast expenditure of artillery ammunition required in modern war could never be met were it not for railway facilities. Whilst the appearance of super guns in the field of battle was only rendered possible by railway traction. We must, therefore, clearly appreciate the influence of railway systems on artillery power, and the direct effect which their efficiency must exercise on the support available.

4. Lessons affecting artillery tactics.

(a) *Preparation for the attack.*

Although somewhat slow in our deductions we at last appreciated the fact that it is better to employ the available artillery power for the neutralisation of the hostile defensive fire power during the attack, than to attempt to destroy the obstacles erected by the enemy for the protection of this fire power. We learnt that with sufficient time, guns and ammunition, together with the sacrifice of surprise, most obstacles could be sufficiently destroyed by artillery to render them passable by attacking troops. These results, however, were only obtained by creating new obstacles which arrested the progress of the administrative services, whilst hostile reserves, warned through the loss of surprise, brought the offensive to a standstill. On the other hand we have seen that short hurricane bombardments produce a condition of torpor in the defence, do not materially sacrifice surprise, and render the success of an attack possible in spite of only partial destruction of obstacles.

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Protracted preliminary bombardments may, therefore, be looked upon as only applicable in exceptional cases, whilst an artillery preparation in the shape of a hurricane bombardment presents distinct advantages worthy of our serious consideration. The introduction of tanks has naturally rendered popular the selection of rivers as defensive lines, we are consequently certain in the future to find ourselves confronted with problems of attacks entailing river crossings unsupported by tanks. A close study of the German methods of artillery preparation for the attack at Riga and in their western offensives of 1918 are, therefore, worthy of close study from an artillery point of view.

The war has left us on the threshold of gas warfare, with a clear indication that artillery is one of the best mediums for its employment. We can form some fairly clear ideas as to its possible effects when used for the preparation of an attack, but any deductions that may be drawn require careful examination since they are based on the use of gas in its elementary stages.

(b) *Support of the attack.*

The necessity for engaging the hostile artillery during an attack stands out very clearly as one of the lessons of the war. We have seen that in the early stages of the war a tendency existed to neglect this necessary measure, owing to the difficulty of locating hostile batteries. The Russo-Japanese war had begun to open our eyes to the fact that with the modern developments of artillery fire it was no longer possible to expect efficient artillery fire from batteries sited in the open and subjected to concentrations of hostile artillery fire. The use of covered position was becoming a necessity. Improvements in aircraft, with the increased facilities for observation which they entailed, rapidly forced batteries to seek cover from air observation as well as from the ground. The difficulties of engaging the hostile artillery increased in proportion to the amount of cover provided for guns, and yet the importance of efficient counter-battery work remained constant. We were repeatedly shown that failure to obtain mastery of the hostile artillery jeopardised the success of the operations as a whole. We are still faced with the same old problem of the artillery battle to obtain superiority of fire, but in a far more complex form,

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whilst the war has left us as a legacy our present intricate counter-battery organisation, dependent on scientific instruments and the very closest co-operation with aircraft. Up to the present the sound and flash of discharge remain as the two principal factors in locating hostile guns, but the day may not be far distant when these are both sufficiently reduced as to further increase the problems of counter-battery work. Although details as to the method and procedure must necessarily be technical matters mainly concerning artillery officers, yet the necessity for a general understanding of the requirements, possibilities and limitations of counter-battery work by all commanders and their staffs is essential. Questions such as the counter-battery policy to be adopted during a campaign or an operation can only be decided by the commander. He alone has the necessary information available to decide whether a policy of destruction of hostile equipment is likely to meet with any chances of success, whether destruction of hostile artillery personnel had better be aimed at, or whether neutralisation during vital periods is better calculated to meet the requirements of the existing situation.

Turning now to the direct support of the attacking troops we may learn from the war that in a deliberate attack some sort of moving curtain of fire must be provided in advance of the assaulting troops. This curtain may either be provided from a stationary point of origin, such as the artillery deployed to support an attack, or from an armoured point of origin moving with the attacking troops, such as tanks in support of an attack. In the last year of the war we saw the advantages to be derived from a combination of both these methods, when artillery and tanks combined in producing the necessary fire power required to render forward movement possible. We have gathered valuable information as to the required density, depth and nature of such curtains of fire, and as to the relative advantages of shrapnel, H.E. or smoke under varying circumstances. Whatever the details of the system may be we find ourselves confronted with the difficulty of co-ordinating the respective forward movement of the attacking troops and this curtain of fire, a problem which the war has left unsolved. Up to the present the previously fixed time programme for the advance remains the most suitable solution, but falls far short of require-

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ments. The method employed in the tactical handling of our fire power is too rigid to admit of full benefit being derived from the tactical manœuvre of troops carrying out the attack. The introduction of the tank has led to considerable improvement by admitting of less rigid manœuvre of fire. By assuming the responsibility for the minor evolutions of fire in close proximity of the attacking troops, the tanks have left to the artillery the larger manœuvre of fire for which it is best suited. As a result a higher degree of combined tactical mobility has been attained. The problem is, however, only partially solved, the ideal to be aimed at must admit of a tactical manœuvre of artillery fire regulated in accordance with the situation confronting the attacking troops. Such an ideal can only be arrived at by the provision of some immediate and reliable method of wireless intercommunication between the artillery and the attacking troops, be they cavalry, infantry or tanks.

Surprise remains one of the predominating factors in war; methods of artillery support must, therefore, be based on a method admitting of the retention of surprise. Accurate unregistered and unobserved fire is, therefore, an essential in modern war. As a corollary it may be stated that large scale accurate maps of future possible theatres of war become a necessity if we desire to develop the full artillery power at our disposal. The danger must be recognised that by cultivating the necessary methods to ensure accuracy of unobserved fire, we should, as a result, be led into neglecting the advantages afforded by observed fire under conditions when such fire is possible. This tendency was apparent during the last war and must be energetically counteracted.

(c) *Support subsequent to the attack.*

Alternate periods of static and mobile warfare characterised the general conduct of operations during the last war. The necessity for an elastic system of artillery control stands out clearly as the lesson to be derived from this fact. Deliberate operations require the maximum available artillery power, this can only be produced by the massed employment of the artillery, namely extreme centralisation of command. On the other hand, in the subsequent mobile operations, owing to the present degree of development of

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our means of intercommunication, immediate decentralisation becomes necessary to profit from the situation created by the deliberate attack. The tactical handling of the artillery must therefore be based on the most elastic system of control.

(d) *Defensive operations.*

In the defence, amongst the many lessons which require our consideration, four stand out of special importance. In the first place, the inefficiency of the thin defensive linear barrage, distributed evenly along the front as a means of protection to a position. Although possibly efficient in dealing with counter-attacks when an offensive density of artillery is available, we have learnt that on purely defensive fronts, with consequent reduced density of artillery, best protection is afforded by allotting definite zones to the protection of the artillery.

Secondly, the German attacks of 1918 supported by hurricane bombardments proved the difficulty in such circumstances of estimating the actual moment at which the hostile attack is launched. The inadvisability of endeavouring to change the tactical distribution of the artillery fire at this critical moment is, therefore, self-evident.

Thirdly the necessity for depth in the distribution of artillery in the defence was repeatedly proved.

Finally, the improvements in methods of counter-battery intelligence render it necessary to keep defensive batteries silent prior to the attack when circumstances are such as to admit of the enemy establishing an efficient system of counter-battery intelligence. The liberty of action of defensive batteries is therefore dependent on the time available for the preparation for the hostile attack.

5. Conclusion.

Periods of peace produce a tendency to increase mobility at the expense of fire power, whilst war has always demonstrated that mobility is dependent on fire power in the field of battle. In our training and preparation for war, the retarding effects of hostile fire power cannot be reproduced, whilst younger generations are unable to imagine accurately its effect. The necessity for the

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employment of our own fire producing arms as the primary method of maintaining mobility, is not brought home to us, we fail to realise the degree to which our mobility depends on them, and are only struck by the loss of mobility enforced by the handling of such cumbersome arms.

We are, therefore, faced with the grave danger of repeating former errors by sacrificing fire power to mobility. If we can avoid this evil we shall have learnt to apply the primary lesson of the great war.

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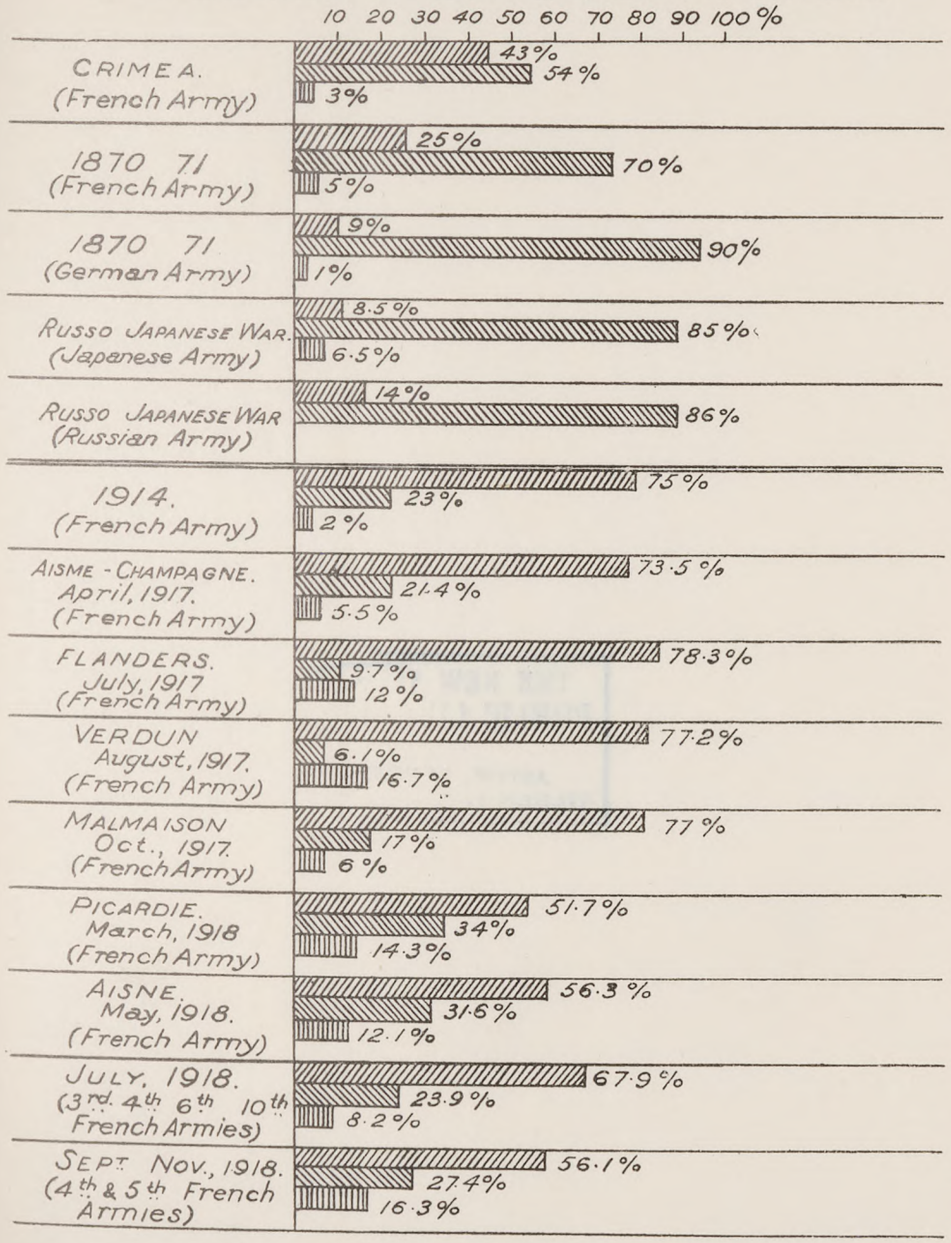
Appendix. L

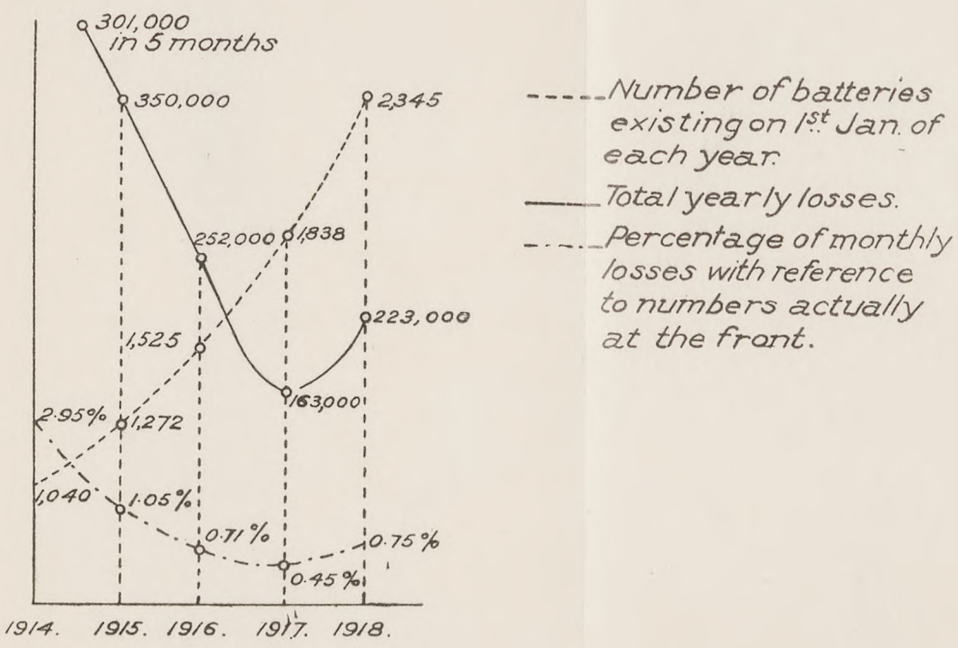
Diagram indicating proportion of various natures of wounds prior to and during the GREAT WAR.

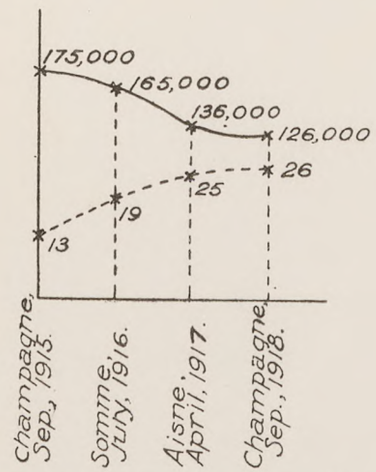

10 20 30 40 50 60 70 80 90 100 %
CRIMEA. (French Army)
43% 54% 3%
1870 71 (French Army)
25% 70% 5%
1870 71 (German Army)
9% 90% 1%
RUSSO JAPANESE WAR. (Japanese Army)
8·5% 85% 6·5%
RUSSO JAPANESE WAR (Russian Army)
14% 86%
1914. (French Army)
75% 23% 2%
AISME - CHAMPAGNE. April, 1917. (French Army)
73·5% 21·4% 5·5%
FLANDERS. July, 1917 (French Army)
78·3% 9·7% 12%
VERDUN August, 1917. (French Army)
77·2% 6·1% 16·7%
MALMAISON Oct., 1917. (French Army)
77% 17% 6%
PICARDIE. March, 1918 (French Army)
51·7% 34% 14·3%
AISNE. May, 1918. (French Army)
56·3% 31·6% 12·1%
JULY, 1918. (3rd. 4th 6th 10th French Armies)
67·9% 23·9% 8·2%
SEPT NOV., 1918. (4th & 5th French Armies)
56·1% 27·4% 16·3%
Shell & grenade wounds.....
Bullet wounds (rifle & M.G.)...
Other causes of wounds.....

(Original by "Medecin Inspecteur General Toubert" Revue d'Infantevie, 15th Sept., 1921)

Appendix. M

Graphs illustrating comparison between increase in Artillery & losses in the French Army during 1914-18.





(Originals published in L'Artillery, ce quélle a été, ce quelle est, ce quélle doit êtve by General Herr)

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THE REGIMENT AND WIRELESS COMMUNICATION.

By Captain W. C. Holden, D.S.O., M.C., R.A.

EVERY gunner knows the difficulty of maintaining a telephone line in a battle area and the difficulty of supporting infantry in moving warfare by artillery fire. In nearly every tactical situation there arises the vital problem of establishing and maintaining communication between observation post and battery. A ray of hope is thrown on the solution of these problems by the development of radio communication.

There are some who see in wireless a panacea for all their ills. There are others, not entirely without knowledge of its possibilities and limitations, who maintain that the difficulties of wireless communication in the field are too great to be overcome except in the distant future. Between these two extremes there are those who see in wireless a means whereby the task of the gunner will be made less difficult and the efficiency of the artillery, as a supporting arm, will be considerably increased. It is the intention of the writer, who places himself in the last category, to discuss the use of wireless in its present state of development, the type of set required, and certain points connected with training and organisation, from the point of view of the Regiment.

2. *The use of Wireless.*

There is a tendency to consider that wireless is a complete substitute for ordinary line telegraphy and telephony and that when wireless sets of sufficient reliability are introduced, the older means of communication must disappear altogether. On first thoughts this appears to be the correct view. Consideration of the limitations and possibilities of both methods will show, however, that there is, and will be for some time to come, a place for both in the means of communication within a battery.

The characteristics of line telegraph and telephony are too well known to enter into details. The time taken to establish communication and the difficulties of maintaining it are directly proportional to the distance to be bridged. Cable is very liable to be cut by

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shell fire or other means. The introduction of cross country motor vehicles is likely to make matters worse in this connection. On the other hand the telephone is a comparatively simple instrument to use and, except in forward areas in position warfare, is not likely to be overheard.

Wireless has certain characteristics which may be divided into definite advantages and disadvantages as a means of artillery communication. A discussion of these will help to form a true estimate of its value.

(a) *Advantages.*

(i) Capabilities of modern sets.

Small portable sets, not more than two man pack loads, are capable of maintaining excellent communication over the limited distances required for artillery purposes (three to five miles). Speech is transmitted more clearly than with the ordinary telephone and, with the power available, little variation may be expected as the result of alterations in weather or other conditions.

(ii) Speed.

Communication is rapidly established: usually a matter of two or three minutes from the time it is decided to erect a station.

(iii) Immunity from shell fire.

Shell fire has little effect, as the only vulnerable points are the actual sets. These are small and easily concealed.

(b) *Disadvantages.*

(i) Limitation of the number of stations.

Only a limited wave band can be allotted for artillery purposes, and consequently the number of stations which can operate in a given area is strictly limited: otherwise mutual interference may prevent inter-communication. In this connection it may be necessary to demand an exclusive band of wave lengths sufficiently large to enable ten or twelve stations to operate on a divisional front: this should be ample for the artillery.

The trend of modern developments, by the use of short waves and more selective apparatus, is causing this disadvantage to assume less importance.

(ii) Jamming.

Communication may be interrupted, or in extreme cases

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entirely prevented, by means of interference from other transmitters. The interference may be unintentionally caused by our own or enemy stations working on similar wave lengths, or it may be deliberately caused by the enemy.

Mutual interference can be almost entirely eliminated by careful allotment of wave lengths, restriction of the use of wireless to the vital needs of the occasion and the use of the best apparatus.

Deliberate jamming on the part of the enemy is a possibility, but it seems that in moving warfare the possibility is a remote one.

Firstly, it implies that the enemy, if he attempts to jam all wave lengths, must needs deny himself the use of wireless, including communication with his aircraft. It is interesting to note that during the Great War, with apparatus which was not very sensitive and liable to be jammed, there was very little difficulty in receiving messages from the air and conducting long shoots by that means. Deliberate jamming did not prevent effective counter-battery work being carried out.

Secondly, during moving warfare, the technical difficulties of producing powerful disturbances, sufficient to prevent small stations working over short distances, are considerable.

It is reasonable to assume, therefore, that the freedom of interference with wireless communication in the field will vary in accordance with the mobility of the operations. In moving warfare, when forces cover large areas and other means of inter-communication are difficult to maintain, wireless interference will be at its minimum, and consequently wireless will be the most reliable and quickest method of communication.

As operations become more stabilised, the possibility of wireless being jammed assumes greater importance, and wireless cannot be relied upon to the same extent as the chief means of communication.

(iii) Location of wireless stations by the enemy.

An active wireless station can, at present, be located with a reasonable degree of accuracy. The use of a transmitter in a battery position may give away the location of a battery with sufficient accuracy to draw effective fire on to it. In order, however, to secure locations of wireless transmitters, it is necessary for the enemy to have direction finding apparatus in the area. Such apparatus and its controlling organisation may be compared in many

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ways to our flash spotting apparatus and flash spotting sections. Posts have to be erected and fixed trigonometrically. There are similar difficulties as regards synchronisation of observations. Probably the time taken for such an organisation to function will be approximately the same as in the case of flash spotting sections. Consequently, when actually on the move or in action during mobile operations, a battery using wireless has little to fear from being located with any degree of accuracy.

When operations are more stable, the use of remote control—a means whereby the transmitting apparatus may be lodged in a small shelter some distance away from the operator—will help to conceal the actual position of the battery. In fact this places a further means of deception in the hands of the battery commander.

Future developments may permit of forward stations, such as at O.P's etc., being screened from the direction of the enemy, in very much the same manner as the reflector of a Lucas lamp prevents the enemy from intercepting a message sent from front to rear. The forward positions could not be located by enemy direction-finding apparatus, and signals from front to rear would not be overheard.

(iv) Secrecy.

At present, wireless in the field may be overheard by anyone within range with suitable receiving apparatus. Developments are taking place which in time will make secret transmission of messages possible; but sets which will transmit and receive without being overheard are almost certain to be more complicated than the simple sets which broadcast to everyone. It is questionable therefore, from the artillery point of view, whether it is desirable to complicate our apparatus in order to obtain secrecy. In the battery the most important and urgent messages are those concerned with observation of fire and fire control. Such messages, provided that actual ranges are omitted or sent in cypher, are of little use to the enemy. In moving warfare it would be a waste of time for an enemy to attempt to deduce very much from the fire orders of the batteries engaging him.

Messages containing information as to the progress of operations and location of troops, either enemy or our own, may have to be sent in cypher. There will be occasions, however, when speed

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is essential and the information only of temporary importance or concerning facts which are already known to the enemy, when telephony may be used and messages sent in clear.

The conclusion to be drawn from the above is that both wireless and line telephony are needed by the gunner to insure the maximum efficiency of his battery as a supporting fire unit.

Broadly speaking, it is during moving warfare operations, such as advance guards, encounter battles and withdrawals, and in the later stages of the attack in position warfare, that wireless will render the greatest service. When conditions are more stabilized and deliberate operations are needed, the value of, and the need for, wireless diminishes. It becomes less reliable as a means of communication and may even be a source of danger. It is then that the use of cable is preferable and the use of wireless should only be resorted to in case of emergency.

3. *The need for the issue of wireless equipment to the Regiment.*

The rapid development of wireless and the knowledge that the present rate of development will certainly be maintained for some years to come, is the reason for the apparent tardiness with which wireless has been adopted for artillery purposes in most armies. As methods of transmission and reception are being improved from year to year, very often by radical changes, all existing sets become obsolete very rapidly.

In the case of the production of a set for military purposes the time taken is considerable. Consider what happens. First of all, amongst other things, such questions have to be settled as permissible weight, power, portability, selectivity required and the wave lengths on which the set is to work. The set is then designed and produced in an experimental form. Prolonged technical experiments are carried out and as a result certain modifications are made and incorporated in a further model. This again is probably tested and eventually the set passes beyond the experimental stage and is produced in the quantity required and issued to units. Operators are then trained to use the particular set, and finally it is used for practical purposes.

The time which has elapsed since the set was originally designed is probably a matter of many months, if not of years. From the technical point of view the set is obsolescent at the time of com-

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pletion. By that time it is possible to design a set of less weight, easier to manipulate, of greater efficiency and better in every other way. Possibly it has been discovered that a different waveband would have given considerably better results. It is natural, therefore, for the technical expert, who has already got something else in view and knows what developments are likely in the future, to be reluctant to advocate the production of sets in anything but very limited quantities. In these days of financial stringency the policy of producing sufficient wireless equipment for little more than technical experiment meets with approval. From the artillery point of view however—and in the next war it will be a matter of intimate concern to the infantry which are being supported—there is another side of the question which is liable to be overlooked. The introduction of wireless will mean a considerable amount of organisation and training in the Regiment before anything approaching full value is obtained from it. There may even have to be radical alterations in artillery technical methods, drill and procedure. These subjects will be discussed later.

Some of the problems which will arise can be foreseen, but no doubt there are others which will appear that cannot be foreseen. The best solution to all these problems must be based on the results of actual experience. It is a mistake to wait for the perfect set. If we do, we shall be faced with the possibility of having something new and untried thrust upon us during the opening stages of the next war. At a time when the Regiment ought to be getting the maximum assistance from wireless, we shall be greatly handicapped through lack of experience in its use. It is not too early to allot a definite waveband exclusively for artillery purposes and to produce a sufficient number of suitable sets to be issued to the Regiment as a whole and not only to isolated units for experimental purposes. Such sets must be the best that can be designed to-day. The Regiment will then be able to accustom itself to the use of wireless and to appreciate its value. The many important problems of employment and organisation will be seen and the best solutions discovered. The production of such sets need not prejudice research and design for future requirements. The possible alteration of waveband is of no importance. The issue of more up-to-date equipment at a later date, perhaps after the outbreak of

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war, will not bring with it any new problems which are likely to cause serious difficulty, but will simply increase the efficiency of the Regiment.

4. *The type of sets required.*

(a) *Wave length.*

The first question to be decided is the allotment of waveband. It is suggested that a band be given somewhere between 50 and 100 metres which will permit fifteen or twenty telephony stations of the type proposed scattered over an area ten miles square being used without undue mutual interference. The waveband must be one which is not being used by the other arms or by the Royal Air Force. The sets must be designed to cover this waveband and to have the maximum selectivity consistent with ease of manipulation.

(b) *Telephony and Telegraphy.*

There are two schools of thought as to the question whether telephony or telegraphy is the best for artillery purposes. Telegraphy has greater mechanical accuracy, but on the other hand the "personal touch" which is afforded by telephony is of great value in many circumstances. The artillery set must incorporate both methods of transmission. There is no great technical difficulty in this. Switching from speech to telegraphy can be made as simple as it is with the ordinary D 3. telephone.

It is of interest to note that, with the same electrical power, telegraphy has a considerably greater range than telephony, and it is possible to transmit telegraphic messages under conditions of interference that would render telephony unintelligible. As a further advantage, a great many more telegraphy stations can operate on a given waveband as compared with telephony. It follows that, even if telephony is used as the normal method, telegraphy will have to be resorted to in extreme cases.

(c) *Range.*

The sets must be able to give good communication up to a distance of five miles under adverse conditions. Signals must be strong at this range. This implies that under good conditions communication may be established up to 20 or 30 miles.

(d) *The need for two sets. Weights. Points of design.*

At present it is customary in the service for two wireless signal

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stations working with each other to use the same pattern of set. Artillery sets are required for communication between the battery position and the O.P. The conditions as regards concealment, transport of sets, and exposure of operators are entirely different at the two places. It is these conditions, particularly that of transport, which impose the limitations in design. Deficiencies in a transmitter or a receiver, caused by limiting the weight for example, can be compensated to a considerable extent by increasing the efficiency of the receiver or transmitter respectively at the other end.

It is logical therefore, that in order to obtain the maximum efficiency in communication between battery and O.P., there must be two distinct sets, one for use at the battery, the other for use at the O.P. and in the forward areas.

The O.P. sets should not exceed 80 lbs. in weight : this weight to include aerial gear and all other accessories. Possibly the receiver and transmitter of this set may be constructed as one instrument, with considerable saving of weight and ease in erection. Portability, speed in setting up, and simplicity in operation are essential. This set should have all its component parts and accessories housed in not more than two containers suitable for carriage as manpack loads. During erection the minimum number of wires should have to be connected and the time taken must not be more than two or three minutes. The aerial arrangement must be low and inconspicuous. Duplicate hand microphone and earphones on extended leads must be incorporated so as to allow the set and operator to be placed behind cover whilst the officer can actually speak from better points of observation up to 100 yards distance away. Operation of the set must be sufficiently simple to enable the ordinary battery telephonist of average intelligence to use it after a few hours training.

The battery sets, on the other hand, need not be limited in weight and portability to the same extent. The station, with all accessories and spares, might be limited to 200 lbs. Although normally carried on wheeled or animal pack transport, it must be capable of being carried by man pack or hand.

Remote control is desirable up to a reasonable distance. The receiver must be capable of being mounted on a car or other

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mechanical vehicle and receiving messages when it is moving over a fairly smooth surface at a slow speed. Alternative aerial gear may have to be provided for this purpose.

Both the transmitter and receiver of this set could be made more powerful and more selective than in the case of the O.P. set. Larger and more conspicuous aerials may be tolerated. Finally, efficiency need not be sacrificed for the sake of extreme simplicity as the conditions of use should be better and the operators more highly trained than at the O.P.

5. *Provision of Personnel.*

The question has been raised as to whether the operators of wireless with R.A. units should be gunners or signallers attached from the Royal Corps of Signals. To the writer, there seems little room for doubt that the operating personnel must be found by the Regiment. The effectiveness of a battery in war is very largely a matter of its communications. They form an integral part of drill and fire discipline. Everything depends on the proper transmission of orders which are of neccessity peculiar to the arm and which call for the highest training on the part of signallers. It would be unsound if the selection, training and control of any of the signalling personnel of the battery was not in the hands of the battery commander, who, in the end, is responsible for the efficiency of his command.

We have discovered the necessity of being responsible for our own transport; the necessity for running our own wireless communication is even greater.

The choosing of suitable personnel for training in the use of wireless does not present any great difficulty. There are already quite a large number of men who take considerable interest in the subject and who are able to construct and use their own apparatus. Any good battery telephonist can be trained into a good wireless operator. The number required is about six per battery. They can actually replace existing telephonists on the establishment as, owing to their training, they are able to act as ordinary line telephonists if need be. Owing to the small number required and the comparatively large field for selection, there is no reason why the R.A. wireless operator should not be the best type of operator to be found in the service. Wireless is an interesting subject to all

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those who study it, and for this reason it is likely that the men selected will make themselves highly efficient. In the event of war, supply of suitable personnel is a simple problem. Knowledge of wireless is becoming widespread throughout all classes in the country, and little technical training will be needed by the greater number of those enlisted for this purpose.

6. *Training, Organisation and Tactical employment.*

It is only intended to indicate one or two problems in connection with artillery procedure, training, organisation and tactical employment which will arise and which require experiment and consideration. There are many others which will come to the mind of the reader.

The procedure for the reconnaissance and occupation of a battery position, as laid down in chapter 6 of Artillery Training, Vol. I has been evolved as the best solution to the problem, on the assumption that the only means of communication within the battery are line telephony and visual signalling. The most difficult part of the problem is communication between the battery commander and the battery when approaching a position. What modification will be necessary when the battery commander is accompanied by a wireless set with which he can communicate with the battery at any time he desires, whether the battery is on the move or not? Again, at present the O.P. must be selected first and the G.P.O. has then to find a battery position from which communication with the O.P. can be opened within a reasonable time and maintained. This limits the locality in which the battery may be placed. With wireless the question of distance or inter-visibility does not arise. The most suitable battery position from the point of view of concealment, approach, cover, and anti-tank protection can be chosen.

Owing to the freedom of action which wireless gives to both battery commander and G.P.O., the whole procedure in Artillery Training Vol. I may have to be altered and simplified.

The procedure for ensuring the correct passage of orders as laid down in Chap. 7 of Artillery Training Vol. II may not be suitable when wireless telephony is used. The re-organisation of the battery staff to include wireless operators and equipment can only be decided after actual experiment. It depends, to a large extent,

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on the procedure adopted for the reconnaissance and occupation of a position.

As regards training in the actual shooting of the battery with wireless, more practice will be needed in peace time in observation under conditions in which the position of the battery is unknown to the observer and he is placed well forward or to a flank. Finally the use of wireless for communication between a forward observing officer and the battery must be tried in various tactical situations before a correct idea can be obtained as to the extent that it can be relied upon to solve the problem.

Possibly wireless will solve the difficulty of close support. It may be possible to give more immediate support with field artillery equipped with efficient wireless than with pack artillery attempting to work its way forward after a situation has developed. In the retirement, improvement in the means of communication may alter the whole method of employment of artillery in order to give better covering fire to the withdrawal of the other arms. These and many other tactical problems require attention.

7. *Conclusion.*

The time has arrived for the provision of suitable wireless equipment for artillery purposes, in order that the Regiment can accustom itself to the use, and appreciate the possibilities and limitations, of the newest and most important means of communication. Whatever its disadvantages may be, wireless does provide a method of communication when all others are impossible. Adoption of wireless cannot but help to improve the efficiency of the Regiment.

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PREDICTED SHOOTING.

By Captain J. O. M. Ashley, R.A.

THE application of survey methods to gunnery in the field appears still to be viewed by some Gunners in rather a sceptical light, largely on the assumption that the next war between civilised nations will be of a highly mobile character, in which tanks and gun and troop-carrying tracked vehicles will play the predominant part.

Infantry attacks from the outset of the 1914-18 war were liable to be held up by a few strands of barbed wire and a machine gun here and there. The tank eventually appeared as the antidote to these defensive measures which the infantryman could not overcome without great loss. I have not yet read or seen anything that has convinced me that a satisfactory antidote to the tank itself is going to be so difficult to find; rather I picture the infantry, by no means obsolete, armed with a heavy machine gun or pom-pom, holding their own against tanks.

In any case the opposing countries are unlikely to have large numbers of tanks in the field in the early stages of a campaign; the cost of manufacture is too high to allow of maintaining large numbers in peace time, and transportation problems, such as the provision of special ships, may delay the appearance of the existing armament in the theatre of war. Again the physical features of the country to be fought over may prevent or hinder the employment of such weapons.

Thus it appears safe to assume that on many occasions deliberate attacks against more or less organised defences will have to be carried out, and ample time will be available for survey methods.

Good as were the German organisation and equipment in most services throughout the 1914-18 war, the standard they reached at the end of it in counter-battery intelligence was not very high. The inefficiency of their flash spotting groups, and their lack of a sound ranging instrument capable of producing results of practical

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value, may have left an impression on the minds of many gunners that these methods of obtaining information about the opposing artillery need not be regarded too seriously.

On the other hand, the German opinion on the matter must have been very different; no enemy gun on the western front towards the end of the war could open fire to range or register without running a serious risk of having its position reported within five minutes to the British Counter-Battery Staff Officer concerned. The accuracy of this location would be good enough to enable effective neutralising fire to be brought to bear as soon as desired, presuming local conditions to be reasonably favourable at the time.

In those days sound ranging and flash spotting worked in close co-operation; both functioned when possible, but when weather conditions prevented one from working, those very conditions were often the best for the other. A mist might blind the flash spotters, but the calm air that goes with it would favour the operations of the sound rangers.

The sound rangers appear likely to lose soon this help in locating a hostile gun, for the propellant that a technically advanced adversary may use against us in a future war will probably be of a flashless nature. The flash spotters must change their name; their main value will lie in their power of reporting and locating rapidly signals or other indications of developments in the tactical situation, or of the progress of our advanced troops—they are the only personnel organised for this purpose. They can also supplement the work of the surveyors by fixing the positions of targets or other objects within the enemy lines.

It can be safely assumed that the success of our counter-battery intelligence has not passed unnoticed by the military experts of other countries. So the battery commander in the next big war may find himself confronted by fresh developments in methods of locating guns, providing unexpected accuracy and scope of action. Amongst them will appear sound ranging in a more perfect form, for as long as shells are propelled into the air, a disturbance of the air—which constitutes a sound—will occur.

One of the principal precautions which help to render more difficult the location of gun positions is the withholding of a

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battery's fire until the moment when all guns open in support of some definite operation. If this precaution can be taken, the opening of fire comes as a surprise to the enemy, as he will have had no indications—assuming the occupation of positions has not been betrayed in any other way—to draw his attention to an approaching attack by the forces opposed to him. To enable this measure of surprise to be obtained, the opening of fire by scattered batteries or guns at different times must be entirely dispensed with, except in the cases of special guns such as anti-aircraft guns and others on self-propelled carriages.

We must therefore whenever possible do without ranging and registration; for a battery so firing provides a series of gun reports at comparatively long intervals and offers the easiest target a sound ranger could wish for, if there is not much other artillery activity going on at the same time in the immediate neighbourhood. It requires very heavy firing from many guns to shield a battery from the attentions of the sound rangers.

Thus both the Higher Command and the battery commander require some means by which fire may be effectively opened at short notice by day or night, the former in order that their plans may not be disclosed, the latter to avoid exposing unnecessarily his guns to being neutralised when their fire is most needed. This is rendered possible by "survey" methods, providing the muzzle velocity of each gun is known, its sights are in correct adjustment, and the effect of local weather conditions can be accurately estimated and corrected for.

Some system of reference by which ground features can be readily described is essential to successful co-operation between the various arms, and the one adopted should extend over the whole area in which the operations may be carried out. The army has adopted the simplest form—the rectangular "grid," on which points are referred to by their distances east and north from a given "origin." Survey methods enable all points that interest the gunner—gun positions, observation posts, targets, etc.—to be fixed on this system, and their co-ordinates thus found provide not only data from which their relative directions and distances apart can be calculated, but also a means of designating these points that will be readily understood by every one in the force.

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This same grid is also overprinted on the maps of the area, if they exist on a suitable scale and projection. In England we are accustomed to using such excellent productions as the 1/20,000 and 1-inch series of maps, and so are apt to forget that no other country in the world is mapped so accurately and completely, and that in many possible theatres of war the topographical information is of the most scanty nature. Thus such a map as the 1/20,000 will be available during the early stages of a campaign only in the most exceptional cases and will not be available at all if much movement takes place.

One is more likely to find that nothing better is ready than a $\frac{1}{4}$ inch map, perhaps somewhat inaccurate, and this means that the gunner has to function without any tactical map at all. But if the Survey Companies R.A. and the brigade survey parties circulate the co-ordinates of all points they fix by survey methods, large numbers of points collect on the rectangular grid which soon develops into a skeleton map; for the positions representing batteries or targets usually coincide with topographical features which provide cover for us or the enemy, or with means of communication.

So a large scale map is by no means essential, though certainly a great convenience; it can be replaced by the results obtained by our surveyors.

"Predicted" shooting affords several incidental advantages in addition to opportunity for surprise and improved defence against hostile artillery intelligence. The scope of a battery's action is increased, for a battery dependent on ranging is limited to the targets visible from its observation post. The accuracy of the fall of the first rounds should be such as to result in economy in time, labour and ammunition, and cause casualties among the enemy before he has time to take cover. Increased effect is gained by far-reaching and accurate harassing fire; increased variety is possible, allowing of timed concentrations of all natures of guns against important targets, and fleeting targets can be quickly dealt with. But no opportunity must ever be missed of using observation from ground O.P's. or from the air to check the accuracy of the predicted shooting.

The gunner is now being taught that in time of war he will be

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able to derive the advantages of survey methods from a bearing picket, sited within easy reach of his battery by personnel of the Survey Company R.A. The latter contains in its new organisation divisional survey sub-sections, and to help in forming these—and also in the name of economy—the number of surveyors in a battery has been reduced from four to one.

Now unity of control is as essential to a survey organisation as to a transportation system, and if the officer commanding the survey company is to get the best out of his personnel and prevent waste of time and labour through duplication of work, he must retain control over the divisional sub-sections at least until the opposing forces have come to a standstill. Personnel cannot always be allotted in the early stages on a basis of so many men to a division or divisional area; the distribution must depend on the varying topographical features of the area being fought over and the consequent difficulties in extending a system of triangulation (or framework of fixed points) over it. Normally, however, each divisional sub-section will be allotted one divisional area.

Under certain conditions of ground or weather the brigade may find that their private bearing picket is a long time coming and that, although they are ready to go into action, no one has fixed any targets for them. In such a case no amount of reduction in survey personnel of batteries will excuse the brigade from making good this lack of survey data, either by adopting an arbitrary grid, fixing points on it, and correcting later to true co-ordinates, or by obtaining from the survey company the co-ordinates of two or more points already fixed, and working forward to their brigade area from them.

If survey methods as applied to gunnery in the field are not to be dropped—and I cannot conceive such a step being taken—a knowledge of elementary survey must soon be recognised as necessary to every gunner officer. Survey is still regarded by many as a mysterious subject only fit for specialists with strange tastes, and this impression has been strengthened by the recent reduction in numbers of surveyors with batteries and increase in the establishment of the Survey Company R.A.

Very few years ago the idea of applying corrections, due to varying conditions of weather, to line and elevation was only

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slowly overcoming the antagonism of those who saw in it but the invention of an unpractical theorist. Such corrections are now universally recognised as necessary; similarly in time survey methods will be accepted as the normal for obtaining line and elevation, just as—for example—the T.O.B. method was accepted in preference to the cruder ideas prevailing before it was thought of.

Predicted shooting is not a new invention of the Great War; it is the logical development of methods in use in 1914.

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ANTI-TANK DEFENCE AND CLOSE SUPPORT.

By Captain C. T. Beckett, m.c., R.A.

The present situation.

Of the many problems of policy, which, since the close of the great war, have exercised the minds of the general staff, the allied problems of anti-tank defence and close support of the infantry, may be said to hold an important place. The close relation of these two problems has of itself caused difficulties in their solution.

The pack howitzer has been impartially recommended for trial as a solution of both problems and has been equally impartially attacked when it appeared to fail in both respects.

It is a common fault in the solution of tactical problems to allot to cavalry a dual role, both protective and offensive, and it would appear that a similar error has been perpetrated when allotting to pack artillery its tasks, and when subsequently criticising its performances.

A mobile reserve.

While the pack howitzer is a most portable weapon and is capable of the closest approach to such targets as are of immediate interest to the infantry, it is nevertheless of comparatively slow speed in transit and is extremely vulnerable whilst on the move.

In the Great War it was unusual for a brigade of artillery to be held in reserve or to be withdrawn from the field except for purposes of defence in depth.

It was customary to commit the whole available artillery to action and so make as certain as possible the result of the contest. So far as this was applied to the more mobile natures of artillery, no great harm, tactically, could ensue.

The insistent demand for more and closer support.

There are but three batteries of pack artillery with the division and their comparatively low speed together with their paucity of numbers and the insistent call for more and closer support, will tend to cause all three pack batteries to be committed

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to action. The withholding of one in reserve, sufficiently withdrawn to hasten to reinforce threatened points, will not commend itself to the divisional commander when he considers the speed of a tank attack and the vulnerability of the column of slow moving men and animals sent to engage it.

It is therefore probable that, as the battle develops the pack artillery will become wrapped up in their duties of close support and in many cases will be pinned to their ground as surely as are the infantry they are supporting when events are not going according to plan.

Inadequate speed of pack artillery.

Even if a battery has been held in reserve to deal with a hostile counter-attack by tanks, it will, by its low speed and vulnerability, be unable to make itself effective unless good fortune should direct the hostile attack to its immediate vicinity.

Highly mobile unit as an anti-tank attack reserve.

To remedy such a situation, and to free the pack artillery for duties of close support as its primary objective, a highly mobile and easily concealed reserve must be placed at the disposal of the pack artillery commander with which he can reinforce the pack battery, engaged in its duties of close support, which is in the immediate vicinity of the tank attack.

Such a reserve will but place the pack artillery commander in a similar position to every other commander whose troops are charged with duties of encounter; a position which he has hitherto lacked.

Alone amongst artillery commanders his units are habitually employed in individual contests which partake more of the nature of the infantry fight than of artillery action.

The wide dispersal of his units has hitherto rendered their reinforcement difficult and, as already indicated, in the case of anti-tank defence, abortive from its commencement.

Naval action.

Tank action approximates more and more to naval action as mobility, speed and armament increase.

The counter attack to a fleet action is by destroyer, submarine

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or C.M.B., torpedo attack : by the most mobile, the least armoured and, as torpedo carriers, the most heavily armed vessels available.

Some such tank destroyer, lightly armoured, adequately armed, easily concealed, must be designed, organised in batteries, and placed at the disposal of the officer responsible for anti-tank defence—the pack artillery commander.

Broad details as to type.

Let us now consider the type of vehicle we desire.

It must have a low freeboard, be of superior speed to the tank from which hostile attack is expected, be heavily armed and lightly armoured to withstand machine gun fire. Its crew can be reduced to two if the armament is simplified.

Its steerage must be quick and simple and should be such that it can be operated by the gunner with his feet, leaving his hands free to manipulate and fire his gun. The gun should be of such a calibre that it will penetrate unquestionably armoured tanks at at least 300 yards range. Some such automatic gun as the Italian 37$^{m/m}$ is required. It must be automatically loaded and unloaded. It will not require an all round traverse.

The second member of the crew will be entirely concerned with the care and maintenance of the engine.

The vehicle will consist essentially of the tracks, connected in the rear by the engine housing and bearing between them from the engine forward a simple platform on which the crew can lie side by side and head and tail on.

At the forward end of the platform will be mounted the gun. Side protection will be given by the track boxes, rear protection by the engine housing, front protection by the gun shield.

An overall length of 12 feet, a platform 8 feet by 4 feet in breadth and a maximum height overall of 4 feet 6 inches should be sufficient.

The platform should be suitably cushioned and have adequate grips to keep the crew in position over rough going.

The petrol capacity would be limited to the ordinary requirements of a day's march, with a reasonable margin for accidents.

It is possible that in such a vehicle we have fulfilled also the requirements of portage of the close support weapon.

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Allotment and Employment.

A battery of eight such tank destroyers should be allotted to each pack brigade as a fourth battery. It would, tactically, be kept in local reserve near a point whence a good view of the battlefield could be obtained, and could be used for the riposte to the tank counter attack at any place, with reasonable certainty of successful reinforcement before the attack had penetrated too deeply. Ability to take cover due to low freeboard would greatly enhance the value of speed in dealing with such attacks.

Care must be taken to prevent their premature employment. The danger of the pack artillery commander being influenced by local and personal demands for support both for the immediate assistance of the infantry and to repel what may be isolated and local tank attacks or feints to draw this reserve, will always be present.

The tank is so new a weapon that support will often unjustifiably be demanded just as artillery close support is often demanded to deal with local troubles with which the infantry are adequately equipped to deal.

It will be the proximity of the danger or obstacle and the personal nature of the demands which will make denial difficult.

In no other respect, however, will the pack artillery commander be more disadvantageously placed than any other commander who has constantly to refuse demands for reinforcements.

It should be less difficult for the pack artillery commander to accede to demands for close support if he can rest assured that his local reserve thus constituted to deal with an enemy which is a danger to the force as a whole, is efficient and readily accessible at short notice at the threatened point.

The close support weapon.

We have considered the pack artillery brigade as a frame work for close support, and, reinforced by a battery of tank destroyers, as adequately equipped to form a first line of resistance to a hostile tank attack.

It must not be assumed, however, that in the 3·7 howitzer we necessarily have the ideal weapon to undertake the duties suggested for the pack artillery. There are, no doubt, many better possibili-

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ties of design and portage if the problem is considered from a purely European standpoint.

Our commitments, however, are world wide, and in considering this problem it must be remembered that anti-tank problems are localised geographically by their limitations to "European" warfare, while close support is a feature of all warfare, against all kinds of enemy.

It is further complicated by the difficulty existing in certain theatres of war of obtaining other forms of artillery support.

It follows that the weapon which, supported by heavier natures of artillery, may be suitable for European warfare, may not be so elsewhere when such support is lacking.

The introduction of a specialised close support weapon for European warfare is therefore a matter for weighty consideration, and its anti-tank and mobile properties should be outstanding before we re-equip our divisional pack brigades of the expeditionary force, or their mechanised successors, with a weapon possibly inadequate for the demands of close support in our Asiatic and African dependencies, where the 3·7 howitzer has found considerable favour.

The problem is one for which all nations are seeking a solution, but their problems are not always ours, and their solution will be along clearer outlines, while ours must always be of the nature of a compromise. It is fortunate that our national genius for such a solution so frequently provides a satisfactory answer.

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THE FUTURE OF THE REGIMENT.

By Lieut. V. C. Ritchie, R.H.A.

IN the Journal of the Royal Artillery of April, 1926, Colonel Rowan-Robinson, C.M.G., D.S.O., in the article titled as above, sketches the possible (and he suggests probable) lines on which the future organisation and development of the Regiment should take place. If all the data on which he bases his arguments and contentions are accepted as being correct and as complete as possible, then, it must be admitted, the case for a "Revolution" in organisation and armaments, within the next 20 years, such as he suggests is very strong.

There is hardly a chink in the armour; but to those, like myself, who are inclined to be conservative, and who regard the methods and weapons of war as being a matter of "Evolution", rather than "Revolution", there appear to be gaps in his data, unbridged by arguments and examples, and unsupported by the limited experience, under conditions of war, of the weapons concerned.

There are various disadvantages attributed to the "dragon-gun" that I submit do not really exist, and there are many arguments in favour of the retention of medium and heavy artillery in its present form, that he has completely disregarded. The object of these notes is to examine very briefly, some of these. The italics denote extracts from Colonel Rowan-Robinson's article.

"*Neither bayonet or sabre will then (in 15 years) be the decisive weapons. They will have been supplanted respectively by the slow moving tank and the fast moving tank.*"

No explanation is given as to how ground won by tanks is to be held against counter attack, and, to carry things to their logical conclusion, what would be the situation of a fleet of tanks that had advanced all day, if counter-attacked by infantry at night.

Speaking of the "dragon-gun" he says "*he (the dragon-gun) cannot hope that enemy tanks will line up along a defensive position to give him a target.*"

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They will not—therefore, until tanks have the powers of endurance credited to "Felix" the cinema cat—there will always be defensive positions, if only for the night. The infantry will remain the mass who alone can occupy and hold a position that has been won. Meanwhile the tanks withdraw and prepare for a further advance. Here, at least, is one use for our medium and heavy artillery as at present constituted—to harass the tank-parks, assembly places, etc. Moreover as the infantry will meanwhile be in occupation of the ground won and as there is no reason to doubt that the "moral will be to the physical as three is to one," here again we will require our light, medium and heavy artillery, as to-day constituted, to lower the moral of the opposing infantry, and to prevent the dragon-drawn field, medium and heavy artillery of a conservative enemy from lowering the moral of our infantry. And again the billets of auxiliary troops, communications, avenues of approach, dumps, depots, rail-heads, and staffs will still remain worth shooting at.

"*Dispersal of infantry strength in escorts and dispersal of guns*" is given as a disadvantage to dragon-drawn guns being the means of defence of columns on the march against armoured car and tank attack.

(1) But why have infantry escorts? What can they do against tank attack. As the normal composition of advanced guards etc., in the future, will include tanks (if the country is suitable to their employment), the normal method of protection should secure a column against this form of attack, and the dragon-drawn artillery of the column will be secured against infantry and cavalry attack by these normal protective measures.

(2) If you cannot afford to disperse dragon-drawn guns, how can you afford to disperse tank-guns that have replaced them?

(3) Dragon-drawn guns have at least the following advantage. They can range further than a 3 pr. tank gun, and have, therefore, some hope of hitting the tanks, before they can hit back.

If a gun, stationary, with a good field of view, cannot hit a tank, what chance will a gun in a tank (with a very limited field of view,

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and bumping fiendishly) have. We have no experience of tank versus tank results to enable us to estimate their possibilities.

"Thus, whatever form of argument is followed, the old platitude recurs—the proper antidote to the tank, is the tank."

The dragon-drawn gun is the only other antidote considered. Now, the submarine was not the antidote to the submarine, nor was the torpedo-boat the antidote to the torpedo-boat, nor was gas the antidote to gas. One might almost say that a counter-part, can never be an antidote. At the best it is then "even-money" and that is at variance with the principles of war.

Personally, I think that aeroplanes armed with guns of sufficient size to disable a tank, and capable of a rapid rate of fire, aimed by diving at the tank, offer considerable field for experiment. There are no insuperable difficulties of design and such machines would be most useful for other purposes. America has already produced and fired such a gun from an aeroplane. The gun, is, I think, better than bombs for anti-tank purposes. Demonstrations of the latter against tanks, that I have seen, have been most unconvincing.

Tank-destroyers are a possibility, no doubt, but I think their design will be far removed from that of the present trend of tank design. I suggest *really* fast, small, light and handy tanks, bullet proof only (to get lightness), and armed with a gun (3 pr.), the function of such tanks being much the same as that of torpedo-boat destroyers in the Navy. They would rely on their speed and handiness for invulnerability. Tank mine fields, another possible antidote, are in their infancy. An automatic sight for field guns is another possibility, and although one suitable for use on land has not yet been produced, an increased demand might alter this.

Finally as regards anti-tank work in battle—a vivid picture is drawn of *"confusion—a jumble getting more and more tragical until the last line is passed."*

(1) But what if it is passed? Troops to whom the tank is no novelty (invested with super-human and super mechanical powers) and whose moral is high, will not be defeated because enemy tanks have gone on through them—any more than they were by a dozen low flying aeroplanes in back areas.

(2) Why put in more tanks and add to the confusion? Give

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the guns and aeroplanes a chance until the last line *is* passed, and then let loose the tank destroyers (which will be situated in concealed positions, in rear of the artillery area). As long as the enemy tanks are enveloped in a smoke barrage, they will not do much harm; they may advance but unsupported their position is not to be envied.

The war showed us two things :—

(1) The result of a tank attack in force against an undemoralised enemy, as at Cambrai. The result was a temporary success, but only very temporary, and then the ground won by the tanks was at once occupied by the infantry in force. In spite of this, it yielded to counter-attack.

(2) The result of a tank attack supported by infantry (or to be more accurate—infantry attack supported by tanks) against a demoralised enemy in a country, where every wood, house, and village, and town was rased to the ground, as on August 8th, 1918, and onwards. The results were most exhilarating; but that the results were due to the demoralisation of the enemy cannot be gainsaid, and I often think that the part played by tanks in that demoralisation has been greatly overestimated.

Towns, villages, woods, dug-outs, quarries, etc., afford tank proof cover to man, and I cannot but think that until this fact can be overcome, light, medium and heavy artillery, as at present constituted will be necessary as infantry will remain the pile that is driven into the enemy, tanks forming the steel point only. Tanks may win ground but infantry must occupy it, to hold it.

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AN ANSWER TO THE TANK?

By "Paradox."

"POM-POM'S" article in the October, 1926, number of the Journal, in which he advocates 3 pr. anti-tank guns as the reply to the tank seems to meet this menace, but it is a pity he styled himself "Pom-Pom," a name given to a weapon which would be notorious as a squanderer of ammunition, but for its habit of jamming after a comparatively few rounds.

It is assumed that there is no doubt that the 3 pr. projectile will knock out a tank because if not, all our tanks require re-arming, as the guns they carry are of little value except in the tank v. tank battle. If on the other hand a heavy machine gun will defeat a tank, it would seem reasonable to arm them with that weapon instead of with the heavier 3 pr. Given then a well concealed 3 pr. with bullet proof shield and a trained detachment, what is to prevent that gun from knocking out not one but many tanks? Three reasons suggest themselves :—

(i) Artillery support.
This would undoubtedly make things more difficult if not impossible, but presupposes guns being available in sufficient numbers to demoralize the defence before the tank attack is launched.

(ii) Smoke shell fired from tanks.
Generally speaking the tank has no weapon with which to put down a screen. If they were so provided, the special pieces and the smoke projectiles could only be carried at the expense of more valuable munitions and stores. A tank like a ship is one vast compromise.

(iii) Smoke emitted from tanks.
Here again trouble arises. Meteorological conditions must be "just so" and the amount of smoke producing mixture carried will only see the tank through one of its troubles without refilling.

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Turning again to the 3 pr., what is the type of weapon required? "Pom-Pom" in his article gives a number of desiderata with which all must agree, but he omits the two chief features required of an anti-tank weapon, namely steadiness when firing at low angles of elevation and a high velocity.

Accurate rapid laying cannot be carried out with a weapon which jumps, and the higher the velocity the smaller the travel corrections, i.e., the easier to hit.

Steadiness. The old saying "What is gained on the swings is lost on the roundabouts" holds good unfortunately in artillery design questions. In other words, what is gained in steadiness has to be given up in lightness.

High velocity. This entails high recoil stresses, so that if steadiness is to be maintained the weight of the recoiling mass must be increased or the trail lengthened to the point of absurdity. Recoil cannot be increased without decreasing the rate of fire. Steadiness, therefore, combined with high velocity and shortened recoil, involves extra weight and, without driving in pickets and lashing the carriage down to "Mother Earth," they cannot be attained without this surplus weight.

Obviously much will be gained if this extra weight can be put to some useful purpose. It is not much if carried on wheels, say 2 cwt., but it means all the difference between an efficient anti-tank weapon and a makeshift such as the pack howitzer. Some form of close support weapon is required by the infantry. Its weight would approximate to that of the surplus weight required to make the anti-tank weapon steady. Why not use it for this purpose? In addition to its weight giving increased steadiness there are several other advantages in adopting a design which, for want of a better name, may be called the Paradox System.

(i) The weight of the piece which is *not* being fired acts as a dead weight on the piece which is being fired, so assisting in checking recoil and reducing the recoil stresses. This can lead to a weakening and therefore a lightening of the recoil buffer.

(ii) One detachment only is required for both pieces. Assuming that anti-tank and mortar work are not generally required at the same time, the Paradox system naturally

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leads to a saving of men, as on the above assumption half the combined personnel would be constantly out of action if the normal one gun one carriage method were continued.

(iii) When engaging several tanks it would be a great advantage and might be possible to lachrymatory smoke a few of them with the close support weapon and put them temporarily out of offensive action against the anti-tank gun so leaving it free to engage the other tank or tanks.

(iv) There will certainly be some relation between the shooting of the two pieces so that it will be possible to range with one piece and afterwards fire direct for effect with the other.

(v) Even after the tank menace has been overcome the high velocity 3 pr. can still play a part and will be valuable against any target requiring a flat trajectory and high penetrative power.

An equipment comprising one cradle and two barrels (as proposed for the Paradox), either of which may be mounted in the cradle, is being supplied to a foreign Power. Its disabilities are fairly obvious.

(i) Time wasted when wishing to change rapidly from one barrel to the other, always remembering that the former may and probably will be uncomfortably hot.

(ii) One type of ammunition and the other type of barrel only being available at some critical moment. This can be obviated by strapping the second barrel to some part of the carriage, in which position, however, it plays no part in checking recoil. In other words extra useless weight has to be carried.

The sighting of this "Paradox" equipment should not cause much difficulty. A simple rocking bar sight with shoulder piece is required for direct laying at tanks. The laying of the close support weapon would be met by a simple range indicator arc or dial with an adjustable zero and an open dial sight.

In conclusion it is urged that this problem cannot be solved by long articles written in our press and that of foreign countries, but only by the method of actual trial and error, also that after the ideal equipment has been produced "the man behind the gun" will require a high standard of training.

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ROYAL HORSE ARTILLERY.

Evolution or Dissolution.

By Major (Bt. Lt.-Col.) C. B. Findlay, m.c., R.H.A.

THE future of the Regiment, as indicated by Colonel Rowan Robinson in the April "Journal of the Royal Artillery," will not come in a day, but all thinking officers must agree that we are on the threshold of changes greater and more revolutionary than any since the invention of gunpowder. Already a portion of our field and medium artillery has been mechanised with no loss to its old spirit and traditions. To ensure that the traditions of efficiency and mobility of the Royal Horse Artillery may not suffer in this revolution I advocate its gradual mechanisation. The first question is to consider what present and future roles are best suited to the horse artillery spirit—i.e. quickness of decision and action.

As regards the present :—

(a) The cavalry division as constituted is too vulnerable a target for aircraft and lacking in fire power, yet for some time to come cavalry and light tanks will form a very valuable combination. These arms require an auxiliary weapon giving more fire power than the tank 3 pr., and far more mobility than any horse-drawn weapon can achieve. Cavalry clamour for lighter and lighter loads for their horses. Even now, horse-drawn artillery cannot keep pace with them for any distance. Cavalry also continually call for anti-tank and anti-armoured car protection. Neither horse nor dragon-drawn gun have the necessary "quickness into action" to give this. The "self-propelled gun" is the only solution.

(b) Many Tank Corps officers are of opinion that they require an artillery weapon for the direct support of a tank attack—likewise obviously a "self-propelled gun."

(c) In the defence of an infantry divisional area the scattering of a few fixed anti-tank guns over the field of battle is of

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little use and their employment in large numbers wasteful. A type of "self-propelled gun" similar to that proposed for use with the cavalry and tanks is required. Further, owing to the advent of efficient tractors, the weight of the field artillery weapon, formerly restricted to the pulling power of six horses, can be largely increased. The medium and field artillery will become identical. These heavier weapons, although more economical for many tasks, are even more unsuitable for use against tanks, necessitating eventually a still further increase in the number of "self-propelled guns."

The above three roles, being all of a similar nature, should be carried out by one branch of the Regiment and appear to be the legitimate perquisite of the Royal Horse Artillery.

As regards the future, until experience has been gained by actual experiment with a mechanical force of all arms, it is impossible to forecast with any certainty what artillery weapons will be required. With regard to the light artillery for a quickly moving force, the "drawn" as opposed to the "self-propelled gun" would be too slow into action. Further the necessity for some guns being able to accompany the force anywhere would indicate that a gun on a whole track chassis would be required. As regards the nature of this gun, two types appear to be necessary.

(a) A high velocity gun, for shooting either direct or just behind a crest, to supplement the shorter range weapons of the tanks. A 12 or 13 pr. has great advantages over the 18 pr., i.e. less weight of gun, mounting and ammunition. The question of the possibility of this gun being mounted so as to prove of value against lower flying aircraft, also should be considered.

(b) A low velocity weapon of the Stokes mortar type, but with a longer range and a powerful smoke effect.

In conclusion the present and future roles of the lighter nature of gun would appear to be of a similar character and of a character suited to the spirit and traditions of the Royal Horse Artillery. Further, unless the Royal Horse Artillery adopt a modern policy, which in my opinion will cause it to rise "Phœnix like" in a new form out of the ashes of its former greatness, it will die and become

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as extinct as the mythical "Dodo." "Whilst looking ahead do not let us forget the present and the great traditions of the past."

NOTE.—Although I advocate that the future weapon of the Royal Horse Artillery should be the extremely mobile gun mounted on an all round track chassis, yet for the present in the Near East and India, until the effect of heat on the crew and desert sand on all metal tracks is known, the multiwheel tractor, carrying a semi-track (for use in emergency), might be considered. The performances of the light six-wheeler car (such as the Renault) over soft sand are marvellous. Personally I have seen a six-wheeler Renault pull a loaded Crossley tender over sand where six horses could not have moved it. Experiments would have to be made as to the best type of "six-wheeler" as now better types than the Renault are obtainable. The tractor itself must not be overburdened either in size of body or in load carried. A battery, with guns and transport drawn by such tractors, would be, for "desert work" far more efficient and for normal eastern countries not less efficient than a horse-drawn unit. With regard to economy in peace time, a battery consisting of some 20 horses (for officers and staff) and 16 six-wheeler tractors would in capital cost be about equal to a battery with 160 horses. The annual cost would be much less owing to the saving in forage and the pay of some 50 men.

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THE ROYAL REGIMENT OF ARTILLERY.

Further Notes upon its history.

(Continued from page 450, Vol. L.)

BY MAJOR (BT. LIEUT.-COLONEL) J. H. LESLIE *(retired list)*.

1759-1860.

Table showing changes in Establishment.

Year.	Companies.	Total.	Royal Warrants in Public Record Office, etc.	
			Date.	Reference No.
1760	1 (a)	31	13 February	W.O. 55/428. p.23.
1771	10 (b)	41	18 ,,	W.O. 55/367. p.196.
1779	2 (c)	43	30 June	W.O. 55/418. p.77.
,,	8 (d)	51	,,	,, p.79.
1780	1 (e)	52	—	— —
1783	—	51	12 March (f)	W.O. 55/375.
1791	2 (g)	53	—	— —
1794	5 (h)	58	14 August	W.O. 55/380. p.18.
1795	5 (i)	63	6 March	,, p.61.
1799	4 (j)	67	16 July	H.O. 51/143.
,,	2 (j)	69	2 October	H.O. 50/373.
1800	2 (j)	71	3 December	W.O. 55/380.
1801	10 (k)	81	8 April	G.O. of 8 April, 1801.
1803	10 (l)	91	1 September	W.O. 55/381.
1806	10 (m)	101	1 June	At War Office. [1]
1808	10 (n)	111	12 March	,, ,,
1817	—	101 (o)	19 February	W.O. 55/385. p.73.
1819	—	73 (p)	1 ,,	W.O. 55/440, of 20 March, 1819.
1846	8 (q)	81	1 April	R.A. General Order of 2 April [2]
1848	16 (r)	97	16 August	,, ,, ,, 16 August [3]
,,	—	,,	3 November	,, ,, ,, 3 November [4]
1854	8 (s)	105	18 February	,, ,, ,, 18 February [5]
1855	8 (t)	113	1 April	,, ,, ,, 3 April [6]
1859	2 (u)	115	November	See Note *u*.
1860	8 (v)	123	1 April	R.A. General Regimental Order of 19 April [7]

NOTES.—W.O. and H.O. are Public Record Office reference headings.

Figures in brackets following an Officer's name, refer to his No. in the List of R.A. Officers, *vulgo* "Kane's" List.

"To-day" and "now" as used in these Notes refer to 1926.

1 "Warrants for Ordnance Military Corps."
2 *Jackson's Woolwich Journal* of May, 1846, p.70.
3 ,, ,, ,, of September, 1848, p.135.
4 ,, ,, ,, of November, 1848, p.168.
5 ,, ,, ,, of March, 1854, p.39.
6 ,, ,, ,, of May, 1855, p.71.
7 ,, ,, ,, of ,, 1860, p.74.

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EXPLANATORY NOTES.

a. Miners. Became a "marching" Company in 1763 (R.W. dated 14 February, 1763. W.O. 55/363, p. 166), the 1st Battalion being then composed of 11 Companies (Cadet Company included) and the 2nd and 3rd Battalions of 10 Companies each. This Warrant gives the complete establishment of the Regiment in 1763.

b. Two "marching" Companies and eight of "Invalids" raised. Regiment formed into

4 Battalions, each composed of
8 "Marching" Companies (600 of all ranks), and
2 "Invalid" Companies (86 of all ranks).
The Cadet Company is no longer included *in a Battalion.*
The formation of the 4th Battalion was carried out thus:—
2 new Companies raised.
2 Invalid Companies raised.
2 "Marching" Companies transferred from each of the three existing battalions—six in all.
Total 10.

NOTE.—Difference in Establishment for the years 1761, 1763 and 1771.

	1761	1763	1771	Total cost of Establishment.
Field and Staff Officers	22	23	33	
Cadet Company			55	
1st Battalion. Cadet Company ...	55	55		1761
,, ,, 9 Companies ...	963			£91,484. 8. 9.
,, ,, 10 ,, ...		570		1763
2nd ,, 10 ,, ...	1070	570	686	£56,857. 17. 6.
3rd ,, 10 ,, ...	1070	570	686	1771
4th ,, 10 ,, ...			686	£83,061. 16. 8.
Miners Company	76			
Total ...	3256	1788	2832	

c. Invalids. These two Companies now raised, with the eight existing Companies of Invalids, i.e. two from each of the 4 Battalions, were formed into an "Invalid" Battalion of 10 Companies.

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The 10 Companies of the "Invalid" Battalion thus formed (7 July, 1779) were commanded by

Captain's Name.	*No. in R.A. List.*	*Date of Commission.*
Robert Hind, *sen.*	(81)	29 October, 1755.
John Dovers.	(99)	2 April, 1757.
Philip Webdell.	(115)	4 January, 1758.
William Macleod.	(117)	21 October, ,,
Sir Francis James Buchanan.	(132)	1 January, 1759.
George Charleton.	(137)	,, ,,
Joseph Winter.	(123)	1 March, ,,
Edward Whitmore.	(127)	10 Sept., ,,
George Anderson.	(156)	25 November, 1760.
Charles Torriano.	(164)	10 March, 1762.

d. Two Companies added to each of the four "marching" Battalions, to replace the Invalid Companies. See Note c.

e. This Company was raised in 1780 for service in Jamaica. The Warrant authorizing its formation cannot be found, but the following extracts from the Minute Book of the department of the Surveyor-General of the Ordnance (Public Record Office, W.O. 47/91), make it quite clear that it was actually complete in July, 1780:—

15 July, 1780. At Westminster. 601. Ordered that the Surgeon-General prepare a list of Medicines for the Jamaica Company of Artillery. That a Surgeon's Mate be sent with them if there is no Surgeon on board of the Transport in which they are to embark—but upon their arrival, the Island of Jamaica must find a Surgeon for them.

25 July, 1780. 619. Ordered that the usual advance be paid by Messrs. Cox & Mair to the Officers & Men of the Jamaica Company of the Royal Artillery, as desired by Colonel James's Letter of Yesterday.

That Watch-Coats and Canteens be provided & issued immediately for the said Company agreeable to his Demand of 21st inst.

That their Clothing, Arms & Accoutrements be sent down immediately.

632. Ordered that the Committee of Jamaica Merchants be acquainted that the Company of Artillery raised for Jamaica is compleat—& to desire they will order the Levee Money at £3. 13. 6

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per Head to be paid for 116 Men & a letter to the Treasurer to receive the same. That the said Committee be desired to inform the Board if they have any Ships by which they can be conveyed to Jamaica & upon what Terms.

In W.O. 10/168 (Public Record Office) are the Muster Rolls and Pay Lists of this Company (Captain John Daniel Goll) in the 1st Battalion. In the Pay List there is a note—"This is the first Pay List and Muster Roll for this Jamaica Company."

The Muster Roll is dated at Woolwich, 3 August, 1780. The Company embarked in December, 1780, in the transport "Dutton" and reached Port Royal, Jamaica, before 1 February, 1781, where it remained until December, 1783. It was then, apparently, reduced, as by the Royal Warrant of 12 March, 1783, provision is made for four battalions of 10 "marching" companies each, one battalion of Invalids (10 Companies) and "The Master General's Company of Gentlemen Cadets," 51 Companies in all, i.e. the same number as before the Jamaica Company was raised in 1780.

f. By this warrant the pay of a Gunner was reduced from 1s. 4d. to 1s. per day. The rank of Mattross was discontinued and Mattrosses—their pay had hitherto been 1s. per day—became Gunners.

g. Two Companies known as "The East Indies Detachment" were raised and sent out to India in May 1791, arriving in November, and then being stationed in Southern India—Madras, Bangalore, Seringapatam, etc. They were commanded by Captain Thomas Ross (433), who died in India on 10 July, 1794, and John Cockburn (478).

The Company Muster Rolls from May 1791 to September 1793 are in the Public Record Office—W.O. 10/227—but from that date they cease until 1799, when the Companies appear as belonging to the 6th Battalion. These two Companies left India in 1798 and went to the Cape of Good Hope. (See Note j. below.)

h. The 5th Battalion. These 5 Companies are, in 1926, represented by

26th and 27th Field Batteries (2);
7th and 12th Pack Batteries (2), and
1st Medium Battery (1).

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i. Completion of the 5th Battalion. Only 4 of these 5 Companies survive to-day. They are represented by

29th Field Battery; two of them by
22nd Heavy Battery; and one by
17th Medium Battery.

The remaining Company was reduced in 1819. It was reformed in 1895 as 26 Company, Western Division, R.A.; became 60 Company, R.G.A., in 1902, and was again reduced on 4 December, 1919. Its records were taken over by the 22nd Mountain Battery, which became the 16th Pack Battery on 1 March, 1921. (War Office Circular 29/Artillery/4464, issued with Army Orders of May, 1924.)

j. The 6th Battalion. The two Companies, formed in 1791 as "The East Indies Detachment" (see Note *g*), were drafted into the 6th Battalion in 1799, thus completing it to 10 Companies.

Nine of these 10 Companies survive to-day, being represented by

25th, 32nd, 33rd, 81st and 82nd Field Batteries (5);
12th Medium Battery (1), and
20th, 23rd and 24th Heavy Batteries (3).

The Company now represented by the 82nd Field Battery was reduced in 1817, then being Captain James Pattison Cockburn's Company, 1st Battalion and re-formed in 1895 as the 82nd Field Battery.

The other Company was reduced in 1819 and never re-formed.

k. The 7th Battalion, formed by the transfer of 10 Companies of the Royal Irish Artillery, as a result of the Union of Ireland with England.

The following extract from R.A. General Regimental Order, dated at the Horse Guards, 8 April, 1801, explains this transfer:—

"The Royal Irish Regiment of Artillery having by His Majesty's command been reduced to one Battalion consisting of

One Colonel Commandant
One Lieutenant Colonel
One Major and
Ten Companies;

"And His Majesty having also signified his pleasure that the Battalion should, in its present state, be incorporated with the

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British Artillery, *It is incorporated accordingly*, and henceforth forms a part of the Royal Regiment of Artillery, without distinction or difference.

"The Regiment will now consist of seven Marching Battalions exclusive of the Horse Artillery, and Company of Gentlemen Cadets."

* * * * * * * *

Nine of the 10 Companies exist in 1926 and are represented by the

3rd, 4th, 9th, 18th and 28th Field Batteries (5);
10th Pack Battery (1), and
7th, 16th and 21st Heavy Batteries (3).

One Company was reduced in 1819; was reformed in 1900 as 31 Company, Western Division, R.A., and again reduced in 1907, then being No. 27 Company, R.G.A. (W.O. Movement Notice No. 9, of 5 September, 1907.)

See *History of the Royal Irish Regiment of Artillery* by Major J. J. Crooks. Brown & Nolan, Ltd. Dublin, Belfast, Cork, Waterford. 1914. This book gives complete details of the Royal Irish Artillery up to 1801.

l. The 8th Battalion—10 Companies. Nine of these Companies survive at the present time (1926) and are represented by

37th, 38th, 39th 40th and 87th Field Batteries (5);
22nd, 26th and 27th Heavy Batteries (3), and
7th Medium Battery (1).

The tenth Company was reduced in 1819 and never re-formed.

m. The 9th Battalion—10 Companies. Seven of these 10 Companies still exist, and are to-day (1926) represented by the

41st, 42nd, 43rd, 44th, 45th and 82nd Field Batteries (6); and
33rd Heavy Battery (1).

One Company was reduced in 1819; another in 1871, then being 8th Battery, 10th Brigade, R.A.; and the last in 1906, then being 92 Company, R.G.A. (W.O. Movement Notice No. 8 of 1906.)

n. The 10th Battalion—10 Companies.

o. 10th Battalion reduced—10 Companies. The warrant does not mention "reduction" in actual words, but gives full details of a new establishment—9 Battalions only.

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One Company, Captain George Cobbe's, was transferred to the 1st Battalion in 1817, and is now (1926) represented by the 11th Field Battery.

p. Two Companies of each of the 9 marching Battalions, and the entire Invalid Battalion, reduced.

q. A new 10th Battalion, of 8 Companies, was formed on 1 April, 1846. Seven of these Companies exist in 1926, and are represented by

61st Field Battery (1);
14th, 15th and 16th Pack Batteries (3);
14th Medium Battery (1); and
31st and 32nd Heavy Batteries (2).

The eighth Company was reduced in 1905, then being 98 Company, R.G.A.

r. 16 Companies were added to the Regiment on 16 August, 1848, two to each of the first 6 Battalions, designated Nos. 9 and 10 Companies respectively, and one, designated No. 9, to the 7th, 8th, 9th and 10th Battalions. They were commanded by Captains as shown below. On 3 November, 1848, they became Companies of the 11th and 12th Battalions, then formed.

Company.	*Battalion.*		*Became 3 November, 1848.*	
9	1	Harrison, N. E.	1	11th Battalion.
9	2	Cheetham, C.	2	
9	3	Buchanan, C. J. L.	3	
9	4	Payne, W. S.	4	
9	5	Gilbert, W. R.	5	
9	6	Papillon, A. F. W.	6	
9	7	Aylmer, H.	7	
9	8	Levinge, C. R.	8	
9	9	Hamilton, A. G.	1	12th Battalion.
9	10	Fulford, W.	2	
10	1	Irving, A.	3	
10	2	Browne, St. J. T.	4	
10	3	Bingham, C.	5	
10	4	Rowan, H. S.	6	
10	5	Freese, J. N. A.	7	
10	6	Cleaveland, F. D.	8	

Fifteen of the 16 Companies still exist in 1926, and are represented by

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7th, 8th, 19th, 62nd, 63rd, 64th & 65th Field Batteries (7);
8th, 17th and 18th Pack Batteries (3);
11th, 19th, and 21st Medium Batteries (3); and
18th and 27th Heavy Batteries (2).

The Battery which is now 21st Medium was reduced in 1871, then being 8th Battery, 7th Brigade. It was re-formed in 1901, as 32 Company, Eastern Division, and became 104 Company, R.G.A., in 1902.

The remaining Company was reduced in 1871, then being 8th Battery, 17th Brigade. It has not been re-formed.

s. The 13th Battalion. Five of these Companies still exist in 1926, and are represented by

66th and 67th Field Batteries (2);
10th Medium Battery (1); and
33rd and 34th Heavy Batteries (2).

The other three were reduced—

one in 1871, then being 8 Battery, 21st Brigade, and
two in 1882, then being 18th & 19th Batteries, 8th Brigade.

t. The 14th Battalion. These 8 Companies still exist in 1926, and are represented by

68th, 69th, 83rd and 84th Field Batteries (4);

(The two latter were reduced in 1863 then being "D" Battery, 14th Brigade, and "F" Battery, 11th Brigade, respectively. They were re-formed in 1895. See Army Order 112 of 1901.)

8th Medium Battery (1); and
35th, 36th and 37th Heavy Batteries (2).

u. 9th and 10th Batteries, 4th Brigade. They are now represented by 39th Heavy Battery, and 88th Field Battery, respectively.

No official order or authority for the formation of these two batteries can be found at the War Office.

In the Distribution List of Batteries published in December, 1859, they appear for the *first* time, and in Regimental Order of 28 November, 1859, the names of Captains F. W. Haultain (1924) and N. O. S. Turner (2144); and of 2nd Captains F. G. E. Warren (2347) and H. C. S. Dyer (2348), appear as being promoted and posted to these 2 Batteries *by augmentation*, dated 14 November, 1859.

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Horse Guards' General Regimental Order of 1 April, 1859, contains the following paragraph :—

> The present terms "battalion," "troop," and "company" will be superseded by "brigade" and "battery."

v. The 15th Brigade. Of the 8 Batteries of the 15th Brigade, 5 still exist and are in 1926 represented by

19th and 20th Pack Batteries (2);
17th, 41st and 42nd Heavy Batteries (3);
6th Battery, 15th Brigade, was reduced in 1894, then being 6 Company, Eastern Division, R.A.
7th Battery was reduced in 1889, then being 1 Company, South Irish Division, R.A., and
8th Battery was reduced in 1871.

None of these three have been re-formed.

(To be continued.)

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ARTILLERY IN THE OFFENSIVE.

Present-day French and German ideas on the employment of Artillery in the Offensive.

BY CHEF D'ESCADRON V. BUCHALET.

Translated by Brig.-Genl. W. Evans, C.M.G., D.S.O.

NOTE.—*In reading this article it should be noted that the comments are not by the translator. "We," "us," "ourselves," etc., all mean French. In places to avoid confusion the word "French" has been added in brackets.*

THE object of this article is to bring to notice the ideas current in France and in Germany on the employment of artillery in the offensive. The present time seems suitable as the war is sufficiently remote to have enabled both countries to rewrite their training manuals, yet is not so long past as to cause us to forget its bitter lessons.

The German handbooks are worthy of study not merely with a view to learning the methods and mentality of a future enemy but also because the German army had great experience of moving warfare. This was due to the fact that in the beginning of the war Germany was fighting in the East on wide fronts with relatively small forces. Consequently the opposing armies had ample space for manœuvre, and possessed flanks that could be turned.

The French 1921 Instruction on the tactical conduct of higher formations takes care to warn officers who only fought in France and Belgium against being led away by preconceived and false ideas, and recognises the possibility of moving warfare in the next war. The rôles of commanders, staffs, and administrative services are so much more difficult in a war of manœuvre that it is worth studying if only for instructional purposes. In trench warfare centralisation of command can be very largely practised as rapidity of decision and initiative are not usually the main attributes of

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success. In moving warfare on the other hand time plays a most important part, so that decentralisation is more often necessary and smaller units have more opportunity to use their own initiative, when fighting in a wider field of operations. Consequently if we train our cadres to moving warfare, and at the same time keep in close touch with more scientific methods applicable to position warfare, we shall be giving them the best training—more especially the smaller units on whom the brunt of the fighting falls in every class of warfare.

The employment of artillery in the offensive is so intimately connected with tactics in general that it will be necessary to discuss the latter to a considerable extent in this article. After a brief appreciation of the training manuals of the two armies, we shall see how their teaching compares regarding the use of artillery in advanced-guard encounters, moving warfare, and in the attack on an entrenched position.

I.—French and German handbooks.

In France the Instruction for the tactical employment of higher formations was brought out in 1921. The employment of artillery is dealt with in Annexe 1, and a new edition of Artillery Training is now in course of preparation.

In Germany the two handbooks are "Combined Training" (Führung und Gefecht der verbundenen Waffen, in future referred to as F.u.G.) and "Artillery Practice" (Kampfschule der Artillerie, K.d.A.). F.u.G. has a preface by General von Seekt in which he points out that this book is not written for the army of 100,000 allowed by the treaty of Versailles, but for that of a great military power.

The following points are worthy of note: As with us the co-ordination of effort on the part of all arms, particularly infantry and artillery, is discussed at length. Complete decentralisation is approved in certain circumstances. The division is the battle integer. The allotment of artillery considered necessary for a division exceeds ours. Unlike our manuals, moving warfare is treated in great detail. Germany's relative weakness in cavalry and air forces (at any rate in the early stages) is to be compensated for by a wider use of patrols from all arms. Infantry will have light

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cycle detachments with machine guns and possibly artillery, capable of fighting for information. Artillery is encouraged to organise officers patrols. Many of the principles well known to those who went through the war are repeated for the benefit of their successors—e.g. "infantry must hug the rolling barrage without fearing casualties," "short rounds must be expected in protective barrages . . . ." etc., etc.

Before going on to a comparison of the handbooks it is interesting to note the nomenclature of the artilleries in both armies. In Germany we have: infantry batteries, artillery of close combat, and artillery of distant combat. In France, artillery of accompaniment, artillery of direct support, and artillery of combined action. Though apparently analagous these artilleries vary considerably in their use.

Artillery of accompaniment (French) and infantry batteries (German).

France. The 1921 Instruction lays down that units of artillery, batteries, sections, or single guns may be placed temporarily at the disposal of the infantry commanders to destroy obstacles by close range fire, and to follow up as closely as possible the advance of the infantry. This is termed artillery of accompaniment. It is found from the divisional artillery by temporarily detaching field guns. Many Frenchmen regret that a special weapon has not been designed and would like to see the guns definitely handed over to the infantry. Everyone agrees, however, that the general principles of the handbook are sound.

Germany. Infantry batteries are recognised as a separate entity. K.d.A., para. 7, runs thus: "the artillery of a division consists of the divisional artillery and batteries of infantry guns," and further on "infantry guns of the same calibre as field guns, but on lower mountings and more mobile; their range is short and they form part of the infantry heavy armament. As the German artillery at present does not possess special infantry guns these have to be borrowed . . . . from the divisional artillery." Finally para. 1809 states: "batteries of infantry guns will not be under the orders of the artillery but will be under the infantry with whom they work in the closest and most personal touch in the field."

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Artillery of direct support (French) and artillery of close combat (German).

Para. 178 of the French 1921 Instruction lays down that the divisional commander divides his guns into artillery of direct support and artillery of combined action. The same paragraph defines direct support. It practically means that the guns of the direct support artillery engage the nearer targets. Though under the C.R.A's orders he cannot alter their targets when they are shooting for the infantry they cover as the latter have first call on them. On the other hand the C.R.A. gives orders for changes of position. No close support tasks are given to the heavy artillery of the division. French Artillery Training not having yet come out, we have no comments to make on this subject.

Germany. K.d.A. lays down that the subdivision of the divisional artillery into close and distant combat artillery, which is the rule in static warfare, may or may not be adopted in moving warfare according to the tactical situation and nature of the ground. Para 1813 defines the artillery of close combat as follows: "The artillery of close combat—mainly field artillery in moving warfare—will be grouped to suit the infantry dispositions. Its task is to protect the infantry during its deployment for the attack and to engage the targets that are giving it the most trouble—particularly machine guns; to prepare and support the attack; to ensure by its fire the protection of the infantry during the assault, and when a position is carried to facilitate its extension in depth."

This definition of the tasks of the close combat artillery deals entirely with tasks concerned with infantry support, but in contradistinction to our training allows for placing portions of the close combat artillery under the orders of the infantry regimental commanders. We shall come to this later when discussing the support of the attack but may note now the provisions of F.u.G. § 282 and K.d.A. §1817 which lay down that any of the close combat artillery placed in exceptional circumstances and temporarily under the orders of an infantry commander, must be in communication with the C.R.A. so that it can pass immediately under his orders when concentrations of artillery fire are necessary. This assumes that the divisional commander himself commands the fighting line without delegating this duty to the general commanding the divisional

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infantry,[1] and means that his battle headquarters are sufficiently advanced to enable him to follow all the fluctuations of the fighting.

Artillery of combined action (French) and artillery of distant combat (German).

The portion of the French divisional artillery called that of combined action constitutes a reserve of artillery fire available for the use of the divisional commander. Usually "it extends by so-called protective series the depth of fire of the direct support artillery." "It allows the divisional general to exercise his influence on the battle by concentrations of fire on suitable points." This means that in the majority of cases the combined action artillery fires at long ranges—other tasks are "to mask probable O.P's, engage fleeting targets, especially troops massing or deploying for the counter-attack." (Sec. 191, 1921 Instruction.)

German F.u.G. lays down the task of the distant combat artillery as follows: "to paralyze the enemy's artillery and to bombard at long range the enemy when moving, or other important objectives." So the tasks of the German distant combat artillery are the same as those of French artillery of combined action, plus counter-battery work.

II.—Artillery in advanced guard actions.

Annex No. 1 of 1924 (French) has added to and slightly modified the regulations for security on the line of march. Responsibility now rests not only with detachments—advance guards in particular—but it must also be remembered that security also is dependent on intelligence, disposition of troops, and various means of protection from aircraft. One point is brought out not mentioned before, i.e. the need for the advanced guard to picket crest lines giving observation, a most important thing in the encounter-battle. Even if it is not possible to include such crests in the position of resistance, they must be manned by posts.

As to the composition of the advanced guard, the annexe says that the situation may demand the presence of tanks, cyclists, motor machine guns, infantry in lorries, anti-aircraft weapons and some guns. "Unless absolutely impossible the A.G. is invariably sup-

[1] In France the front is divided into three, the General commanding the three Infantry Regiments (each equivalent to our brigades) commands the fighting line.

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ported by artillery when it becomes engaged." But the artillery which supports it is not its own with the exceptions noted above, so that the advanced guard is dependent on the main body. The result is that if any resistance is met with beyond what can be dealt with by the few accompanying guns that may be allotted to the A.G., the commander must halt and wait for support from the artillery of the main body. Now this artillery must be at least 3 kms. behind, and even if this distance can be very quickly traversed by the guns time must be lost in reconnaissance and in the establishment of communications. Take for example the case of an infantry division marching in two columns, each with its own A.G.

The general of the division with his C.R.A. will be with one of the advanced guards if contact appears imminent, but the D.A. staff will have difficulty in getting into action artillery which has to be extracted from the columns of the main bodies. This must result in delays very prejudicial to the progress of the main bodies. In moving warfare this waste of time might prove the salvation of a hastily entrenched enemy. In the encounter battle it might prevent the capture of an important natural feature such as a defile.

The authors of the regulation seem to fear that too hasty action by the A.G. might compromise the main body.

We will now consider the German view of the rôle of an A.G.

In the chapter of F.u.G. on reconnaissance and security, para. 172, we read: "An advanced guard must assure the continuity of the march, overcome slight enemy resistance, protect the main body from surprise, and when superior enemy forces are met with hold on so that the main body may have the time and space to deploy for action." It should be noted that the most important mission is to assure the continuity of the march.

Para. 173 lays down the composition of an advanced guard which will comprise in certain cases, not only infantry, trench mortars, field artillery with ammunition columns, but also: "heavy artillery with ammunition columns, above all long range high velocity guns."

Para. 174 says: "the allotment of single guns to the head of a column is often advisable." All this is very different from the French regulations.

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III.—Artillery in the attack in moving warfare.

The action of artillery is so intimately connected with that of the other arms infantry in particular, that before discussing its employment in the offensive it is as well to see how the two armies propose to carry out the attack in moving war.

The 1921 Instruction, Ch. iv—III—says: "The attacker by his approach forces the enemy if not already on the defensive to put up a resistance and to cover himself with hasty entrenchments . . . . The attacking forces finally come up against a position of resistance . . . ." In other words normally one or other of the forces will always be on the defensive.

On the other hand, speaking of army corps and divisions, the Instruction allows that the enemy may also be on the move and assume the offensive. In this case there will be an encounter battle, though the term is not used in the handbook, and the subject is dismissed with a few notes . . . .

The Germans give a whole chapter to the encounter battle. As to the attack on an enemy in position they give three headings.

(1) *Moving warfare.* Position is organised hastily and capability of resistance varies with the time the defender has at his disposal.

(2) *Position war.* Position organised at leisure with all the resources of field fortification.

(3) *Permanent fortification.* The Germans mean by this a wide employment of armour, particularly for artillery, strong concreted buildings, and all obstacles stronger than those allowed for in field fortification.

In contradistinction to German regulations, ours make no essential difference in the methods of attack on moving or position warfare positions. The approach march and artillery preparation vary. The latter may be curtailed, even dispensed with altogether in moving warfare, if the commander has plenty of tanks and aeroplanes.

To sum up, the Germans devote great attention to the encounter battle which we only remark on; while we practically make no distinction between our methods of attack on positions assumed in mobile or position warfare, the Germans treat the two quite distinctly. Let us examine first the encounter battle.

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(a) *Artillery.* The German handbook is resolutely offensive. It insists strongly on the advantage to be gained by a continuous advance in preparing for battle. To attain this a commander must decide at once and often without accurate information where to locate the centre of gravity of his forces. The book defines two phases: the *engagement* and the *execution* of the attack. This distinction appears rather a fine one, as the engagement is really the first stage of the attack. It is during this stage that the attacker aims at imposing his will on his enemy by means of strongly offensive advanced guards well furnished with material. Covered by these the greater part of the artillery of the main body will provide "a powerful framework on the battle front as it discloses itself." For the execution of the attack, "a commander may decide to pass immediately to the attack, from column formation or from the approach march, so as not to lose the advantage gained by quick action." (§ 177.) To follow the employment of the artillery we must make use of the two terms used in F.u.G.—engagement and execution.

Engagement. Artillery of the main body takes part in this just as much as that forming an integral part of the advanced guard. The allotment of artillery to the A.G. is justified in the German handbook by the tasks of the advance guard on the line of march, and also by the mission allotted to it when battle is joined. "Often it will be advisable to disperse as early as possible portions of the advanced guard artillery over a wide front so as to force the enemy to make wide deployments which will take time. . . . This is particularly the case when the enemy seems to be beforehand in his preparation for battle. . . . Another task of the advanced guard artillery is to support infantry who must seize quickly and at all costs prominent features in front or to the flanks, which would form good artillery observation stations—also villages, woods, etc. . . . ." (§ 263.) "Employment of advanced guard artillery in distinct groups may lead the enemy into serious error." (§ 263.)

The artillery of the main body must from the very outset be ready to form a framework to the front as soon as it becomes clear where the battle will take place. "When artillery lacks observation and is widely dispersed, if it remains under command of

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the C.R.A. division, adequate support of infantry is difficult to attain. It would then seem advisable to waste no time in placing portions of the artillery of close combat under the orders of the infantry" (§ 265.) This last sentence shows clearly the German line of thought and is worth commenting on. As we have already said all the D.A., both artillery of close, and of distant combat are under the C.R.A's orders. But the handbook points out that in cases where ground observation is lacking, good artillery effect can only be gained by establishing close touch with the infantry. The Germans consider that this close liaison can only be attained by the subordination of artillery to infantry. We shall touch on this again when discussing the execution of the attack. Let us now turn to the action of the artillery of the main body in this phase. The situation can only be cleared as the fighting develops, and so it will be necessary to keep some artillery in reserve. This method of successive efforts has a double advantage; the better distribution of the artillery on the ground (especially disposition in depth) and quicker power to act by the artillery of the main body, which would be cumbersome to move from a concentrated mass.

In para. 270 the handbook advocates the constitution of officers reconnaissance patrols, even from the artillery. F.u.G. is very strong on the importance of this and para. 276 states: "All observations from the front line, more especially from the artillery should be communicated to the commander of the troops as quickly as possible. They are the most important guide to the selection of the direction of the attack." The artillery handbook is bound to accept the constitution of these officers patrols, but owing to the serious drawback of detaching officers far from their units, they foresee certain difficulties in the practice. (K.d.A., § 1828.)

Execution of the attack.

The employment of artillery in this phase of the encounter battle is given in detail in F.u.G., para. 282, which deals entirely with artillery. The first tasks assigned to the artillery are "to protect the march of the infantry to the zone of assembly then the deployment of troops moving to the attack."

The whole of the D.A., including the advanced guard artillery, is under one commander. The artillery is not necessarily divided from the commencement into close and distant combat artillery;

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all depends on circumstances. During the assembly preceding the attack, the close combat artillery is seldom allotted to the infantry but "one should never hesitate to do so, when owing to bad visibility, width of the front or difficulty of command, the subordination of the artillery to the C.R.A. is likely to be prejudicial to the support it should give when required by the infantry."

The book is quite definite on the subject of infantry batteries. They are allotted to infantry regiments and used by single guns as far down as the infantry company. "The task of the infantry batteries from the commencement of the battle and acting in co-operation with the other heavy infantry weapons is to help overcome local resistances, to silence machine guns or groups of machine guns, trench mortars, and enemy guns . . . ."

"The close combat artillery when allocated to the infantry will not split up into single guns, but act by units and usually concentrated." In certain cases, however, some batteries may be split up and used similarly to the infantry batteries. There is one proviso worthy of note: "Close combat artillery placed under infantry orders must be in communication with the C.R.A. so that he may be able to carry out any orders for concentrations of fire he may receive from the divisional commander." The handbook lays down the fronts of attack in moving warfare as: 400-800 m. per battalion, 3 to 4 km. for a division well supplied with artillery in ground favourable to all arms. These, however the book takes care to point out must be elastic and the amount of artillery available must rule them to a great extent. Directly the infantry reach the zone of effective infantry fire the whole of the artillery, including as much of the artillery of distant combat as can be spared, turn their fire onto the enemy's infantry. When within assaulting distance the fire reaches its maximum intensity and is concentrated on the decisive point. The handbook adds that it is important to continue the neutralisation of the hostile artillery.

The assault is launched when the enemy appears sufficiently shaken. "In the event of the enemy being disposed in depth it will generally be necessary to overcome the resistance of his rallying points successively by preliminary fire preparation. The attack takes the form of a series of separate combats constantly eating into the hostile zone of resistance. During this period also the co-operation of artillery is very necessary, above all on the part of the artil-

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lery allotted to the infantry (infantry batteries and close combat artillery) . . . ." (§ 288.)

We shall see later that the same ideas apply to the attack on organised positions but may state that what is laid down in F.u.G. is based on Ludendorff's notes to the army in 1918.

Para. 289 defines the tasks of artillery at the moment of the assault. The signal for assault is given either by the Command or by the infantry aided by signals. It is for the artillery to ascertain the time it will take place, when their action may take the form of a rolling barrage. "followed up closely by the infantry without fear of losses." The distant combat artillery at the same time carries out counter-battery work, and distant concentrations.

(b) *Artillery in the attack on moving warfare positions. (German.)*

The commander must decide whether to turn the enemy position, or attack it. The former should always be attempted if circumstances admit. Reconnaissance of a position commences with the approach march; artillery take their share, and their officers carry out aeroplane and balloon reconnaissances.

Reconnaissances of the position must include the location of the enemy's advanced posts, if such exist. This can only be done by fighting, and the command will only employ what infantry are absolutely necessary but will support them largely with artillery. The attacker will seize points necessary for observation and deployment of the artillery. The complete reconnaissance of a position must be methodical, and last long enough for the artillery to make its preparations and give the commander time to decide on his plan of attack. His principal effort should be made on a weak point in the enemy's defence. This precludes any splitting up of the attacker's force *à priori*, this refers equally to artillery and infantry.

In principle, the infantry will only have in its own hands the infantry batteries; the partition of the artillery into close and distant combat units will depend on circumstances. The endeavour will be made for simultaneous opening of fire by the artillery, but this may not always be possible for: "other batteries can only come into action covered by fire from earlier batteries" and "it may be as well to keep some batteries in reserve to surprise hostile guns who may disclose their presence" (§ 320).

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The first task of the artillery will be to cover the deployment of the infantry by paralyzing the hostile artillery. Then some of the batteries of the distant combat artillery will superimpose their fire on that of the close combat batteries, and infantry heavy armament, and bombard important points in the enemy position. Meanwhile the remainder of the distant combat batteries continue to neutralise the hostile artillery. Very close co-operation between the two arms is necessary at this stage to prevent empty spaces being bombarded. "As the attack progresses more guns will be allotted to close combat artillery tasks, and finally as the difficulties of the fighting increase, some of the close combat artillery will be handed over to the infantry. The initiative of these *groupes* or batteries will lead to continuous and very much closer co-operation between the two arms" (§320). "In the battle zone infantry can only approach an enemy position by day, and look for a decision during daylight, when strongly supported by artillery" (§ 321). Contrary to what is laid down for the encounter battle, here the hour of assault will be decided by the command, and not by the infantry in the front line. "It will always be preceded by strong artillery and trench-mortar preparation" (§ 324).

The French handbooks give less detail in this case, and as we have seen may shorten or even abolish the artillery preparation if strong in tanks and aircraft.

IV.—Artillery in the Attack in Position Warfare.

France.

"The offensive battle in this case commences with the assault. When the enemy's front is broken, he probably will establish himself in an organised position to the rear, the capture of which again will require all the resources of the attacker. When the enemy's successive positions have been carried, the battle will assume the character of moving warfare." (§ *98—1921 Instruction.*)

To obtain surprise the Command may curtail the artillery preparation. The Corps commander directs the battle in his allotted zone. "He is responsible for the use of the artillery allotted to him for counter-battery work and distant concentrations. The commander of the corps artillery divides it into *groupements* and allots positions. During the battle the corps commander

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manœuvres the fire of his artillery and orders concentrations." (§ 154.) The divisional general commands the troops carrying out the attack. The division is divided into: The fighting line, artillery and divisional reserves.

The fighting line is usually under the general commanding the infantry of the division and generally has some artillery allotted to it. The D.A. is divided into the artillery of direct support and that of combined action. The use of the artillery is much the same as in moving warfare except that more complete information enables it to be used with greater precision.

The infantry progresses "towards its objective, usually by bounds, supported by fire action; it moves as close as possible behind the projectiles of its artillery . . . . gaining ground by overwhelming the enemy by fire and forcing him to abandon his positions, or to take shelter in his trenches . . . ." (§ 180.)

In para 190 dealing with fire in direct support we find that either a bombardment is kept up on all the nearest objectives until the progress of the attack necessitates a lift, or a rolling barrage is fired or a combination of the two is used. Though the first of these methods appears to be distinct from the rolling barrage, it actually amounts to the same thing. To protect the infantry effectively the bombardment must be dense and continuous; this applies equally to the lifts, so that it bears a very close resemblance to the rolling barrage. Experience shows that incomplete information as to the location of the enemy's fire weapons (or at any rate some of them) forces the divisional commander to protect the infantry by continuous artillery fire. Even if the front line troops can locate the points that are holding them up, it is most difficult to get the information back to the artillery in time for them to act. Accompanying artillery on account of the difficulty of ammunition supply can only deal with small local resistances. Briefly, we get back to the rolling barrage with all its attendant disadvantages[1] . . . .

Germany.

F.u.G., after some generalities on the attack in position warfare, deals with the preparation for the attack before proceeding to the attack itself.

[1] Major Buchalet's comments on position warfare are omitted as the points are well known to Journal readers and are freely discussed in Col. A. F. Brooke's "Evolution of Artillery Methods."

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(a) *Preparation.*—Para 333 gives 2½ km. as the maximum front for a division of three infantry regiments. Para 340 dealing with artillery dispositions says: "great care should be taken to select artillery positions . . . . as far to the front as possible, for the offensive power of infantry against a strongly entrenched enemy lasts just so long as artillery can clear its way" . . . . "The additional batteries allotted to the attack will only be brought up a few nights before it takes place." The sentence regarding the capability for offence of the infantry is important as we shall see when discussing the breakthrough of an entrenched position.

(b) *Artillery preparation.*—Para. 344 defines the employment of the artillery during the preparation of the execution of the attack. In the initial stages the artillery paralyzes the enemy's batteries, principal defences, important centres, and approaches in the back areas. Gas will be extensively used for these neutralisation series. Next, fire from all available guns is concentrated on the infantry positions. This bombardment will cease from time to time so as to keep the enemy in a state of uncertainty as to the actual moment of attack. Neutralisation of the enemy's guns will continue during the bombardment of the infantry positions. Trench mortars take part in the artillery preparation. "Attacks without, or after a very short artillery preparation are exceptional. They can only succeed if they come as a surprise to an already shaken enemy . . . ." (§ 350.)

K.d.A., para 1934, gives an example of how the artillery is grouped.

1 corps counter-battery group ..... (AKA)
1 divisional group for destruction of personnel ..... (IKA)
1 group of long range guns to engage balloons, block areas, camps and approaches ..... (FEKA)
1 group of super heavy guns for very long range series (SCHWEFLA)

Para 1938 gives detailed instruction for the occupation of positions; it divides the process into three periods.

Batteries of the first period: Batteries told off to positions under cover and unseen from the air. These can occupy their positions at any time provided that no new tracks are made.

2nd Period: Batteries whose positions are not covered from

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aerial observation but whose guns can be hidden near their intended positions and which can be manhandled into action. These are brought up before the last night.

3rd Period: Batteries whose positions are not under cover, and are so far from it that horses or tractors are required to bring them into action. These are brought up on the last night. Their number must be limited to avoid blocking roads used by the infantry assembling for the attack.

(c) *Artillery in the execution of the attack.*—At the moment of the assault all available batteries fire a rolling barrage . . . . The artillery handbook estimates that 100 yds. of trench, or one battery, are ready for assault after having been bombarded by one four-gun battery for 3 hours with the following ammunition expenditure :— 77$^{m/m}$, 1200 rds., 105$^{m/m}$ howitzer 900, heavy howitzer 500, mortar 300. "Infantry will only advance, as a rule, when the hostile artillery fire has been silenced . . . . the first infantryman to penetrate the enemy's position should reach it as the last (minenwerfer) shell strikes it." § 1948.

As already stated, the infantry advance is always preceded by a rolling barrage, regulated by fixing lines every one or two kilometres where the barrage will remain stationary for stated periods. Lifts are arranged either on a strict time table, or at the request of the infantry by means of signals. Which method is to be adopted is laid down in attack orders. Unlike ourselves the Germans use all calibres up to and including medium howitzers in the rolling barrage, thus achieving a greater density and depth.

. When the infantry progress has been so great as to outrange the majority of the guns firing the barrage, close combat artillery covered by the fire of long range guns that have already been pushed forward, will be moved up and join the mixed groups under the orders of the regimental commanders in the line. The handbook takes care to point out that this pre-supposes effective counter-battery work and close co-operation with the air and ranging organisations—the latter must be highly mobile. To sum up, the German handbook accepts the fact that the power of offence of infantry lasts so long as artillery clears the way. It achieves this by firing a dense rolling barrage from the greater part of the artillery from positions well to the front to ensure its duration.

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The barrage is halted periodically to enable the infantry to close up. Artillery is definitely allotted to the infantry provided the C.R.A. can resume command when the divisional commander requires concentration. This doctrine of to-day is embodied in Ludendorff's notes to the armies of 17th April and 15th May, 1918.

Their experiences in the spring offensives of 1918 showed the Germans that their accompanying artillery was not strong enough to act alone. They were forced to put field and even heavy artillery under infantry orders. This met with many objections, so much so that Ludendorff himself stepped in to make it clear in his note of May 15th that this procedure was to be adopted; he says :— " . . . . an allotment of this kind has proved to be necessary as . . . . an infantry commander has . . . . need of immediate action on the part of the artillery, which consequently must be placed under his orders—the same units as far as possible being detailed"

These theories sound very attractive, realising as they do the instantaneous change from decentralisation to massed effect.—They pre-suppose, however, not only very close-co-operation between units, but also that the divisional commander has his battle headquarters where he can directly influence the fighting himself without delegating command of the troops in the fighting line to a subordinate commander.[1]

(c) *Break through of an organised front. (French.)*

(Précis.) Before discussing the actual operation, Major Buchalet deprecates the French tendency to curtail the rolling barrage and to rely on concentrations of artillery fire on areas supposed to be held, or on points indicated by the infantry. As at the present time artillery is the most practical neutralising agent he puts forward a scheme whereby the volume of artillery fire shall be assured, so that it can clear the way for the infantry and thus maintain its power of offence.

* * * * * * * *

(Abridged translation.) . . . . On an entrenched front where the defender cannot be certain where the enemy will attack, it is very difficult to organise and to hold more than two distinct lines of defence. The rear position must be so placed that it cannot be

[1] As stated previously the General commanding the infantry of the division commands the front line in the French F.S. Regs.

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bombarded at the same time as the advanced one. It is difficult enough to man two positions, as unless a retreat is contemplated the same infantry cannot fight on both. If a break through is to be successful the attacker must take both these positions quickly. An average of two or three days must not be exceeded in getting possession of both lines of defence; otherwise the effect of surprise will be lost and the enemy will have time to use his general reserve to construct further organised positions.

The attacker's artillery positions must be well to the front so that the least possible number of guns will have to be moved on the first day of attack. Those moved forward will mainly belong to the artillery of direct support and their task will be merely to continue the barrage in depth beyond the limit of range possible from their original positions. There may be difficulties but this procedure is far easier than trying to neutralise weapons that the infantry cannot see, or if they do are unable to point out with accuracy.

The counter-battery artillery, also brought into action as far up as possible, will not be moved on the first day and will work in close co-operation with the air force and the ranging organisations. The evening and the night will be occupied in moving the guns up; they should all be in their new positions by next morning, ready to work on the same lines as on the first day.

This is the most difficult part of the operation; communications being the chief stumbling block. All natures of artillery, heavy and field, must be given sufficient mobility to render them independent of roads, either for actually moving the guns or supplying them with ammunition. Attacks take place in crater areas and our adversary excels in the science of destruction.

The technical training of artillery must aim at getting the same accuracy of fire from newly occupied positions, as from those that have been occupied for some time. These are certainly problems but they can and must be solved if success in an attempt to break through is to be expected. Finally our present day artillery is too immobile, field as well as heavy. Our heavy guns are actually, the rest morally—if one may use the term—for want of proper organisation and training. The following improvements appear to be required by the artillery:—

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(a) Greater tactical mobility on the part of guns and ammunition vehicles.
(b) The adoption of a light howitzer.
(c) The grouping of artillery to be reorganised to suit it to moving warfare.

All these problems have been dealt with in detail in articles that have already appeared.[1]

CONCLUSION

It is difficult to draw conclusions of a general nature from the comparison of the methods advocated by the French and German handbooks . . . . We *(French)* have seen that our own tactics in moving warfare are methodical and cautious, whereas our adversary's are marked by an unmistakable boldness and offensive spirit. This perhaps is due to the experiences of the frontier battles, and to the successes against the Russians—often easily gained. It seems a pity that our moving warfare teaching is marked by over-cautiousness, although its importance is fully realised.

As regards position warfare French and German handbooks agree in many points; as far as the break through battle is concerned, both work on the lines that it will degenerate into partial encounters between infantry regiments with artillery under their orders. This may have suited the state of affairs in 1918, but we are justified in hoping for better methods. The problem of artillery support is nearly as difficult when it is arranged between the regiment and the groupe, as it is between larger formations, and cannot be solved by leaving it in the hands of subordinate commanders. Decentralisation, so necessary in moving warfare where time plays an important part, should not be resorted to when attacks on deep entrenched positions are concerned. The rupture of an organised front is more likely to be attained by a succession of combined attacks at short intervals, than by a number of unco-ordinated efforts rapidly diminishing in power. This scheme however will never be possible until the artillery and signal services are given the increased mobility necessary for the war of manœuvre which alone will ensure quick and decisive success.

[1] Organisation rationelle d'un système d'artillerie. Par le commandant Buchalet.—*Revue d'Artillerie*, Aug.-Sept. 1926, translated in the Journal of the Royal Artillery, April and July 1926, under the heading "Artillery Organisation."

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MOTORISATION OF A DIVISION.

Précis of "La manœuvre en automobile" (1),
by Commandant Janssen.

By Major W. F. Armstrong, D.S.O., M.C., R.A.

THE article by Commandant Janssen, "La manœuvre en automobile," in October's "Revue Militaire Française," will interest those who have read General Camon's book "La motorisation de l'Armée," or nearer home Colonel Fuller's article "The Artillery Cycle" in the Journal of the Royal Artillery of October 1926, or indeed all those who are interested in the possibilities of motor transport in future warfare.

After drawing attention to two problems; how to employ the motor vehicles and fuels now available in France; how far these vehicles can carry out the tasks allotted to "detachments operating in automobiles" as laid down in their Field Service Regulations; the author goes on to consider what motor vehicles are necessary to move a division of infantry.

The division, he suggests, could move without horsed artillery or cavalry, but these would be replaced by :—

(1) Special motorised protective units.
(2) "*Portée*" artillery, 3 groupes of 75$^{m/m}$ (36 guns), 1 groupe of 155$^{m/m}$ howitzers.
(3) 1 groupe of anti-aircraft artillery.

The motor transport of the division would include specially fitted lorries to carry the minimum number of horses required to pull the carts for machine guns, accompaniment weapons, cookers, etc. Some horses would also be required for mounted men. The total horses to be carried he estimates at 300. (The 3½ ton lorries carried 3 horses for runs of over 90 miles during the 1924 and 1925 manœuvres.)

For *supplies*, a light column of 20-25 motor vans, carrying 15-20 cwt. is proposed.

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For *ammunition*, more motor vans, working under divisional orders, to replenish refilling points at regimental (i.e. brigade) headquarters, where 5 more vans would be available to supply units in the line.

The divisional reserve would be carried by lorries.

For *petrol*, the author reckons on an average of 70 miles per day (consumption 88 gallons for 62 miles), which works out at about 30 tons not including oil, grease, etc. This is more than the weight of forage necessary for the 5500 horses of a division but the distance reached is 3 or 4 times greater.

This allows 1400 vehicles to move a division of 9500 men, 300 horses, 22 tons forage and rations, 30 tons petrol, 150 tons ammunition. On the move the column would extend 44 miles, the time to pass a given point would be 5-7 hours, and the length of column halted 9 miles.

Special motorised protective units.

Tests in 1924 and 1925 seem to show that such formations must contain :—

(1) Light *reconnaissance units* able to engage the enemy patrols, to search out the ground, and to overcome slight resistances by outflanking them.

(2) A *shock unit* to open a way through the enemy screen for the reconnaissance units.

The light *reconnaissance* unit or armoured car scout squadron would be composed of :—

2 scout sections, each of 3 patrols of 2 armoured cars.

2 fighting sections, each of 3 "groupes de combat" (one N.C.O. and 7 men). These fighting troops, provided with bombs, would be carried in half-track vannettes.

The *shock unit* (as tried in the 1925 manœuvres) would be :—

One company of 3 sections of light Renault tanks (5 tanks to a section).

One support-squadron for tanks, consisting of 4 fighting sections, each 3 "groupes de combat," as above.

The total formation will then comprise :—

1 Headquarters.

3 armoured car scout squadrons.

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1 company of fast tanks.
1 infantry support-squadron for tanks.
1st line (breakdown, supply, petrol, ammunition, ambulance vehicles).
2nd line (petrol supply and ammunition heavy lorries).
Engineers, signals and wireless units all able to cross country.

This special motorised protective unit may be used in whole or in part for various tasks, but it is organised for the normal task of acting as vanguard to the motorised division. For this it would usually act on three lines of advance, each squadron covering 2-4 miles of front (6-12 miles for a division front), and it would have a total fire power of 80 automatics and 30 "groupes de combat" of 1 N.C.O. and 7 men each.

The vehicles required for this motorised protective unit are :—

Scout sections. The vehicles must be proof against rifle bullets and shell splinters, with special facilities for observation, and able to cross any country. To keep the vehicle compact, the crew would be limited to 2 men, able to fire the machine gun or 3·7$^{m/m}$ gun carried in a revolving turret. Speed 22-25 miles per hour.

Fighting sections. The vehicles would have similar chassis to the above but would be able to carry 8 men with their equipment; the front and sides being proof against rifle fire at 300 yds.

In addition to these vehicles, there would be fast liaison motor cars, lorries, vannettes, light tanks and wireless tanks.

In 1924 Citrôën Kegresse vehicles were used but not found to be up to the weight.

In 1925 Berliet 6 wheel drive vehicles were tried with remarkable success.

Operations by a motorised division.

Two difficulties to be provided for are :—

The column is much more vulnerable, and liable to blocks on the road.

Such a division requires a longer time to de-bus and deploy.

These entail a definite secure zone and the moving of the main body to this zone. The technical side requires a *trained personnel* to deal with traffic and other control of motor columns. The tactical side requires that the commander should not be hampered by the technical side.

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The problem of security.

If cavalry has received a start on the motor column, it may under certain conditions ensure security for the column, but the author shows that the motorised division may be rendered self-sufficient. With this object, the division would use its special motorised protective unit for reconnaissance and distant protection, while keeping advanced and flank guards, air force and anti-aircraft units for its near protection.

The deployment of this division may take 1½-2 hours, while the ordinary division can start deploying on the march; on the other hand, the motorised division can more easily make a detour to avoid a resistance or obstacle in its path.

The distant protection may extend to a day's march or 60 miles, but with his motorised units the commander will find it easy to strengthen any threatened point.

A normal distribution on the march would be:—

(1) A vanguard composed of the special motorised protective unit.

(2) A main guard composed of infantry, tanks and artillery detached from the main body, together with engineers for repair of roads and bridges.

As regards distance, 7 to 11 miles between the vanguard and the main guard should give time for the main guard to act, the main guard moving by bounds of 12-20 miles. Between the main guard and the main body, a *minimum* distance of 9 to 15 miles or 1-1½ hours march should give sufficient time. However, to keep moves secret and to escape an attack, the main body may only be able to march at night; in such a case the advanced guard (which can only work by day) may have reached a distance of 50 miles. It would then have to string out patrols to retain security for the main body.

This *maximum* distance could only be used if the enemy was not likely to attack in force. Owing to the vulnerability of the flanks of a motor column, flank guards, mobile or fixed, would be necessary and would use the lie of the country to form a safe screen for the movements of the column. In addition to the self-protection given by fire from the detachments on the lorries, a certain number of armoured cars would act as sheep dogs to round up any stray enemy threatening the column at close quarters.

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For anti-aircraft protection, in addition to A.A. machine guns on the column vehicles, the A.A. artillery would move with the advanced guard and distribute its sections at about 6 mile intervals on the different routes, closing up to the head again when the column has passed.

NOTE 1.—1 French infantry division = 3 regiments = 9 battalions.

NOTE 2.—Since 1918 the French have had their motor transport for moving large bodies of troops organised to undertake 4 types of moves. These vary from type A which includes artillery and essential horses, to type D which only transports dismounted personnel, and essential vehicles with no artillery and no horses; type A had 1000 lorries, type D 600.

1 *groupement* = 6 *groupes* = 24 sections = 480 lorries or 540 autobuses.

In next quarter's number of the Journal of the Royal Artillery a précis of the second article by Commandant Janssen will be given. It describes the actual trial of a similar motorised formation in the French 1925 manœuvres.

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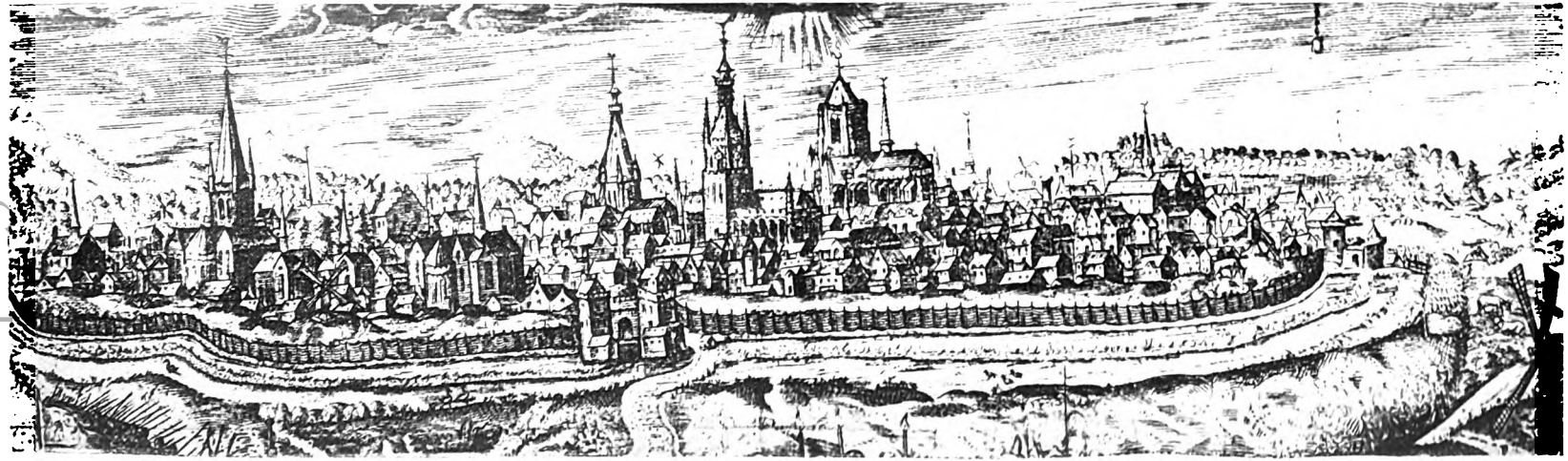
YPRES, the walled city.



YPRES, and its *Tuinen*.

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YPRES.

The Story of a Thousand Years.

By Major A. F. Becke, late R.F.A.

Part I. The first five centuries, 900—1400. *(Concluded.)*

The Battle of Westroosebeke.

Ypres was also involved in Philip van Artevelde's rising in 1381, and after a brief turmoil an Yprois contingent joined the forces raised by Louis of Mâle. Soon afterwards Artevelde entered Ypres and Louis sought the assistance of France, and this country promptly made formidable preparations to deal with the growing trouble. An army under the nominal leadership of the boy king, Charles the VIth, and including both the Duke of Burgundy and Louis of Mâle marched against the rebels. The opposing forces met on the Lys[1] between Warneton and Wervicq and Charles, on his Constable's sound advice, forced the passage at Comines, penetrated between the scattered rebel forces, and then moved forward and received the surrender of Ypres, from which town he demanded a heavy contribution in money. As soon as the submission of the capital of Western Flanders became generally known all the other neighbouring towns, which were isolated by the blow, forwarded their submission to the French King. At the same time they sent in to Ypres the local leaders nominated by Artevelde, and these rebels were promptly executed on the bridge before the Messines Gate.

On the 25th November Charles and his forces left Ypres and moved on Roulers, where Artevelde had previously concentrated. The latter broke up his camp on the same day and moved towards

[1] As Froissart said, "This river Lys is so difficult to cross, that, except at certain places, it cannot be passed. There are no fords, and the country it runs through is so very marshy horses cannot approach it." Yet in 1914 there were people who thought that the Flanders coastal plain would provide cavalry with a suitable terrain for mounted action. "The Lys, the scourge of Flanders" is an old saying.

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Ypres. Artevelde halted his forces "in a handsome position[1]" near Goudberg, on a commanding part of the Passchendaele Ridge, between that village and Westroosebeke. As Charles advanced[2] he discovered that Westroosebeke was occupied by the enemy, and he then encamped before Artevelde's position, the outposts being in touch. The Constable, Clisson, disposed the French army in three bodies: advanced guard, rear guard, and main battle, with the last refused in the centre, and the two former placed in advance one on each flank. A day was spent in reconnoitring,[3] and then on the 27th November the battle of Westroosebeke was fought.[4] In a thick morning fog, Artevelde advanced in a heavy column led by the contingent from Ghent, which escorted a battery of bombards. The storm broke on the French main battle under the king in the centre. Artevelde's guns opened fire and his infantry charged home. At first, such was the fury and weight of the attack, Charles's command was driven back, and for a moment it appeared that it might be broken up and entirely destroyed. But the Constable saw the great chance offered to him to deal Artevelde's heavy column a death blow, for the two wings of the French army had not been assaulted and the Flemish column was really enveloped. Clisson therefore rapidly wheeled the two wings inwards and drove them and the mounted knights and men-at-arms straight against both the exposed flanks of Artevelde's monstrous column. This proved to be the decisive manœuvre, and within an hour the rebel column was ridden over, overthrown, and destroyed, and Artevelde was killed. A decisive victory was gained and the campaign was virtually over.

Charles now, instead of moving at once on Ghent, the centre of revolt, swung aside to Courtrai. He burned the place to the ground so as to avenge the stigma of the French defeat suffered there in the Battle of the Golden Spurs eighty years before. The French Army then moved on to Tournai where peace conditions were dictated. Charles thereupon returned to Paris, leaving Louis of Mâle to pacify his own subjects.

[1] Froissart, (Johnes's translation).
[2] 5,000 Yprois served with the French Army.
[3] As Froissart wrote, "it rained every day." Flanders was maintaining its reputation.
[4] It is often called the battle of Rosbecque, Roozebeke, or Rousbecque. Westroosebeke is seven miles north-east of Ypres.

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THE BISHOP OF NORWICH'S EXPEDITION.

As it was the winter season it was impossible to carry out any active operations to stamp out the smouldering embers of the rebellion, and the people of Ghent once more recruited new forces and continued the alliance with England. Welcome assistance for the Gantois was soon forthcoming. On the 23rd April 1383 an English army disembarked at Calais under the leadership of the Bishop of Norwich (Sir Henry le Despenser).

This expedition was the result of a bull of Pope Urban the VIth to destroy the adherents of the Avignon Pope, Clement the VIIth; and as the church was finding large sums to finance the expedition, Urban had desired that a churchman should go in command of it. Among the Clementists were the French and all their allies and partisans, and consequently the Yprois were also regarded as Clementists. Thus the expedition in some ways resembled a crusade. The invaders of course received assistance from the Gantois and the insurgent Flemish towns, and these insurgents joined the English immediately after the disembarkation and swelled the Bishop's force by about 20,000 men.

Some delay occurred at Calais before the Bishop marched inland. He was waiting for Sir William Beauchamp who had been appointed to act as marshal to the force.[1] The Bishop grew impatient and during the absence of Sir Hugh Calveley, probably

[1] According to Stubbs "the Marshal is more distinctly an officer of the Court, the Constable one of the castle, or army." The Marshal also had military duties to perform and part of his duty was to keep the rolls recording the performance of service due with the king's army. The Constable, however, took precedence over the Marshal, and in the Marshal's Rolls of Edward the Ist and IInd, in which both are named, the Constable comes first. With the Constable in his military duties the Marshal was regularly associated. These two high officers attended the wars, and before active operations they determined if those who owed services by their tenures answered those services by the quality and number of persons required. Afterwards they mustered those who had presented themselves and been passed, and allotted quarters to them. In an overseas expedition they arranged for their transport by sea, and enforced military discipline during the voyage. Upon disembarkation the Constable and Marshal organised the force into its constituent parts, and during the operations they convened and held any courts that were necessary for dealing with both military and civil offences, and for the disposal of prisoners and of booty.

In Edward the IVth's time it was laid down that the Constable should inform the King of the Watch Word and afterwards inform the Marshal, and the last-named in his turn, would then promulgate it to the Army. This again shows that the Constable took precedence over the Marshal.

These were some of their duties in the field, and they were largely those performed by the A. and Q. branches to-day. In England owing to the early disappearance of the Constable, the office of Marshal necessarily assumed increased importance.

(The duties, etc., are taken from Carte's "*History of England*" (1750) quoting John Antis, Senior, Garter King of Arms, J. H. Round's "*The King's Sergeants and Officers of State*," and "*Edward the IV's French Expedition of 1475*" by F. P. Barnard.)

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the most experienced soldier actually accompanying the expedition,[1] he held a council of war. As a result a decision was arrived at to march at once on Gravelines. The combined force of English and Gantois moved on Gravelines, and, the tide being out, the place was taken at the first assault. The force then moved inland and proceeded to lay waste the six overlordships of Western Flanders, defeated near Dunkirk a force of 12,000 Flemings raised by Louis of Mâle, and then took possession of Mardyck, Bourbourg, Dunkirk, Bergues, Cassel, Hazebrouck, Bailleul, and Furnes, but failed to take Aire. After that the ambitious, headstrong churchman pillaged Poperinghe and Messines, and then proceeded to besiege Ypres.

Plan 2.

PREPARATIONS AT YPRES TO WITHSTAND A SIEGE.

That a critical situation threatened to develop had been recognised at Ypres, and adequate steps to meet it were taken in good time. The chief magistrate, in council, had wisely decided to give up the suburban line of defence, for it was far too long a line to consider holding. It was decided therefore to concentrate on the inner line—the close defence of the town itself. The inhabitants were ordered to lay in four months' supplies (a wise forecast),[2] and work was at once begun on strengthening the ramparts and gates. All able-bodied men from the abandoned suburbs were ordered to assist in the close defence of the town, and the others were directed to seek refuge outside the likely area of operations, so as not to complicate the food supply.

As all the outlying houses in the suburbs were to be abandoned it was decided to destroy them so as to deny them to the enemy, and all their joists, beams, doors, shutters, and woodwork were brought into the town to be used in strengthening the earthen ramparts, and in forming shelters to cover the archers and defenders of the parapets.

Artillery had not long been introduced, and although there were stores of stone and sandstone shot, yet all the powder and

[1] Sir Hugh Calveley was a great captain of free companions, who had seen much active service and won great wealth by his raids in France. His shield was silver with a fess of gules and three calves of sable, his crest was a calf's head. He died in 1393 and lies buried in the college he had founded at Bunbury.

[2] The siege actually lasted nine weeks, from the 9th June - 8th August.

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YPRES,
AT THE TIME OF THE BISHOP OF NORWICH'S SIEGE, 1383.

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saltpetre had been requisitioned in the previous year for the Battle of Westroosebeke and had not been replaced. In great haste an inhabitant was sent to Paris to purchase powder and to return with it by the 6th June, and apparently he was successful in his mission.

The force actually available for defence is very difficult to estimate. If we can assume that the population of Ypres and its suburbs was in the neighbourhood of 80,000 souls, then the town alone would have held about 16,000, much the same number as it did in modern times.[1] Thus all told the defence force could hardly have exceeded 10,000 able-bodied men. Nevertheless, as at this time the weapons employed by a besieging force in siege warfare were so clumsy and weak, a garrison of this size was sufficient to ensure an adequate and stout defence.

The town was divided into sixteen sectors for defence, and the force was divided into sixteen companies of 600 each, and in addition there were the three military guilds or societies of St. Sebastian, St. Barbe, and St. Michael, each numbering about 150 men. The Castellan of Ypres, John d'Oultre, who about this time was created Viscount of Ypres, was in supreme command of the defence, and the engineer, John of Comines, was also available to give expert assistance.

The defences of the town require some description. The gateways alone were constructed of stone; the rampart was of earth and it had but a low command, for doubtless excavation in Flanders was as difficult in the XIVth century as in the XIXth, and for the same reason—the proximity of water close to the surface in all the low-lying parts. The top of the earthwork acted as a platform, whilst the edge nearest to the exterior slope was planted with a very thick and well entangled thorn hedge. This hedge was strengthened by stakes bound in a frame, the whole making an almost impassable obstacle about six feet in height. Although at this time practically only arrows, quarrels, and spears, or pikes, had to be guarded against, and this parapet appeared to be quite adequate, yet it was considered wise to add to this rampart a wooden stockade constructed from the doors, shutters, and planks which had been brought in from the houses of the suburbs before they had been set on fire. Behind the stockade a banquette (or fire step)

[1] In 1904 the population was 17,073.

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was built up, which enabled the defenders to loose off their missiles whilst covered by this obstacle. The trace of the rampart, however, was practically innocent of any attempt at flanking defence, and thus the advantage lay with the besiegers, for any serious concentration of missiles on an attacking column would be extremely difficult. Doubtless this fact encouraged the besiegers to deliver the numerous assaults for which the siege is famous, and it stands to the credit of the garrison that every one of these attacks was vigorously beaten off. The rampart was further protected on the enemy's side by a double wet ditch. The water was divided by a berm or low ridge of earth on which was erected a palisade of pointed stakes.

The Bishop of Norwich's Siege of Ypres.

Such was the condition of the place on the 8th June 1383 when the investing force, nearly 40,000 strong,[1] appeared and opened the siege.

The advance of the enemy was observed by watchmen from the Belfry at Ypres. Just as the great town clock had sounded the hour for all workers to begin their daily toil, the vigilant sentries had seen a large moving mass away in the direction of Poperinghe. As their eager eyes scanned the dark array, gleams of light glinting from spear heads and armour proclaimed it to be an army. The English and their Gantois allies were advancing at last. Seizing their copper horns, the watchmen shouted down to the expectant workers below: *"Vijand! Vijand!"* ("The Enemy! The Enemy!").

Instantly all thought of work was forgotten and the one paramount idea was the defence of their city and of their homes. Weavers, woollen drapers, and burghers at once armed and paraded on the *Grande Place*. Here the various companies fell in, and without delay they marched to their respective posts behind the ramparts. Meanwhile the drawbridges had been raised and the gates of the city closed and barred. The council met in the *Halles* for its final deliberations, the standards were run up on the Belfry, and soon the breeze unfurled the banners of France, of Flanders, and of Ypres.

[1] The force has been estimated as 17,000 English, of whom 15,000 were infantry and 2,000 mounted Knights and men at arms, and as well there were 20,000 Flemish rebels, chiefly drawn from Ghent and Bruges.

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All was ready for their reception when the hostile advanced guard of English archers appeared before the Butter Gate.

Finding the suburbs abandoned and burnt, the enemy had closed on the town, the English finally halting and camping on the west, whilst the Flemish took position to the east of Ypres.

The Bishop of Norwich had originally intended to make an irruption into Picardy, and only moved against Ypres very unwillingly. He was urged strongly to this latter course by the Gantois, and also by some of his own officers, who refused to advance with him if he left Ypres behind. Consequently the siege was undertaken. Even so the task at first was not regarded as a very serious operation. As the suburban defence line had been given up it was considered that all that remained to be done was merely the reduction of a keep. But in this case the keep was the city itself, covered by its chief defensive line and protected by wide wet ditches.

On the very first day 1000 English soldiers delivered an attack on the Temple gate. It seems that the Gantois had depicted the Yprois as cowards, and possibly an easy success was expected, also the early successes in the campaign had been cheaply gained. Otherwise it is difficult to explain how an assault could have been delivered without any time for adequate reconnaissance or preparation. This assault was easily beaten off with some loss to the assailants.

On the next day several gates were assaulted simultaneously, but with no success, and in the evening the assailants drew off having suffered considerable losses.[1]

On the third day the besiegers attacked again. This was a general assault on the place and was driven home against several points that the previous day's fighting had indicated as being more accessible to attack. But the result was the same, the defenders stoutly maintained themselves and the besiegers having suffered severely drew off once more.

On the fourth day there were further unsuccessful attempts. Then on the fifth day (12th June) the Bishop of Norwich himself

[1] Gates were usually looked on as weak points in these early sieges, and besiegers generally preferred making an effort to concentrate against and to overcome an entrance rather than batter a way over a long length of rampart, which it was most difficult to breach and overturn with the engines and cannon then available. Also before the rampart could be assailed the wet ditches had to be crossed. It was a weakness in the defence of Ypres that there were so many gateways.

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arrived and brought up another contingent of English troops. This force now completed the investment of the southern and south-western faces, taking the sector between the Messines road and what is now the Poperinghe road; another portion of the force relieved the Flemish troops on the eastern face, and the latter then took over the northern front of attack, whilst the original English detachment remained responsible for the western face. Thus Ypres was finally isolated.

On the sixth and seventh days the Gantois dug out quantities of earth and with it attempted to fill up parts of the outer moat. In this they were partly successful and thus were enabled to cross over to the berm between the two moats.

It was not until the eighth day (15th June) that the besiegers' guns opened fire on the place. Two batteries (in all probability only one gun each) had been placed in action astride the Lille road facing the Messines gateway.[1] We are told that, after the guns opened, the firing was continued by day and night, and it is delightful to recall that each discharge was preceded by a bell being rung to warn the gunners, who were naturally without much experience of what might happen, of the dangers that such artists had to risk. Naturally the bell was also not without its use to the defenders. The fire of the guns gradually broke up the leaves of the Messines Gate, the wooden guard house that had been erected was knocked over more than twenty times, and the wooden erections on the parapet were badly damaged. A record states that these two guns between the 15th June and the 8th August, that is in 45 days, fired no fewer than 450 stone shot, in other words their artists were able to loose off five rounds per gun per day.[2] But alas! the truth must be told, all this prodigious and sustained effort was of no avail as a mankiller, for the guns failed even to wound one single man of the defending force. Artillery was truly in its infancy in the XIVth Century. But over five hundred years later the buildings of Ypres were destined to crumble away under the powerful modern artillery concentrated against it by a ruthless foe.

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[1] This road had been paved before 1323. It ran to Lille, crossing the Lys at Warneton.

[2] This is reminiscent of the 18-pr. ammunition allowance in the dark days of 1914 and 1915.

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Between the 16th and 26th June the investment was continued, both sides limiting their activity to the exchange of cannon shots. On the 20th day of the siege (27th June) the besiegers delivered the fifth assault on the place, directing it against the Temple Gate,[1] and again they were beaten off, losing considerably before they abandoned the attempt.

Between the 28th June and the 16th July the chief events were the arrival of reinforcements from Ghent, followed by renewed activity against the north-western and northern faces of the defences.[2] On this front trenches were excavated between the Elverdinghe and Boesinghe gates to serve as covered approaches, and an attempt was then made to drain the wet ditch between the Steendam postern and the Boesinghe Gate, and to run the water away down the Yperlée. This work naturally was viewed with great apprehension by the besieged, but the value of a double moat was soon apparent, for only the outer moat ran dry. But now that they were covered by only one moat on this front the besieged redoubled their watchfulness in this sector. At the same time the besieging force called on all houses in the overlordship of Ypres and also on those in the overlordship to the north (that of Franc de Bruges) to provide two wattle hurdles per house so as to assist in the passage of the ditches. Non-compliance with this order would entail the house in default being burned to the ground. Things were clearly reaching a critical state for the besieged place. Fortunately in the interval the Yprois managed to communicate with Louis of Mâle at Lille, informing him that, unless outside help could soon reach the place, surrender could not long be delayed. Louis at once passed on this information to his son-in-law, the Duke of Burgundy, and the latter took prompt action. He strongly represented to Charles the VIth that an army must be immediately despatched to Flanders, one, too, that was strong enough to raise the siege of Ypres and defeat the English forces and the Flemish rebels.

On the 39th day of the siege (16th July) two representatives set

[1] The road from Bailleul entered the town through this gateway.

[2] The reinforcements sent to the Bishop of Norwich were however, of poor quality. One authority goes so far as to say that "most of them were unarmed." Their presence therefore did not add to the fighting strength of the force, but merely served to complicate the supply problem.

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out from Ypres, under a flag of truce, and interviewed the Bishop of Norwich. The two Yprois (one a monk) protested their devotion to Pope Urban, and asked the Bishop to break up his camp and lead his forces against the real Clementists. But the Bishop, perhaps naturally enough at this late hour, refused to entertain this proposal and declared that the siege would only be raised when the place had been taken. The parlementaires then returned sorrowfully into the town.

On the 42nd day (19th July) the besiegers made strenuous efforts to push on with their works, but the active resistance offered by the Yprois prevented any serious progress. On the 44th day (21st July) and on the following days the requisitioned wattle hurdles began to arrive. All the rushes were cut down and an attempt was made, on the front held by the Gantois, to fill up and bridge the ditches opposite the Boesinghe and Dixmude gates. The Yprois were not idle. They strengthened their parapet, and during the night of the 21st/22nd July they made a sortie and destroyed the assailants' works and extemporised bridges. The number of gates naturally on this occasion was in favour of the besieged, as egress and ingress were facilitated, and surprise was assisted. This sortie also succeeded in filling up again the dried-up section of the ditch between the Steendam postern and the Boesinghe gate. How this was done is not certain, possibly by blocking the drains cut by the Gantois. On the other hand the enemy held a great advantage, for he could dam the small streams that fed the Dickebusch and Zillebeke ponds,[1] and this would lessen the water supply available for the besieged place.

One account says that the besiegers now attempted to drain the moat on the south-western face between the Messines and Temple gates. But this seems rather improbable, because there was no easy way of draining off the water. This section of the moat was fed by cuts from the Yperlée near the Messines and Butter Gates. Moreover at this period, in wet weather, the whole of the south-western face was covered by an extensive marsh. If this was dry at this season,[2] then this part must have been

[1] Zillebeke Pond had been dug in 1295.

[2] It is not certain that this was the case, because in Flanders the greatest precipitation occurs in the summer and autumn. The ground is then apt to become like porridge, as it did during the Battle of Ypres, 1917.

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drenched with the moat-water once the counterscarp of the outer moat was cut through, and the marsh would have become quite impassable to any assaulting columns and thus the work would have defeated its own end.[1] The account that mentions this attempt states that the besiegers were eventually able to build eight bridges across this stretch, but they were promptly destroyed by the defenders.

On the 48th day of the siege (25th July) the besiegers launched a vigorous attack against the Dixmude Gate. Using the bridges they had made across the moat on this front they managed to make a lodgment on the berm, or dyke, of earth that separated the moats, but they failed to maintain themselves in this exposed position and were driven from it by the Yprois.

Meanwhile Louis of Mâle did not limit his efforts to raise the siege of Ypres to merely appealing for assistance from France. He approached the Bishop of Liège, an Urbanist, and this prelate interviewed the Bishop of Norwich before Ypres, but the meeting was fruitless. Louis then realised that nothing could save Ypres but the advance of a strong army, and he importuned the Duke of Burgundy, then at Compiègne, to hasten the march of the relieving force. The Duke was well informed of the state of affairs in Flanders, and he urged the King to expedite the French preparations. As a result a general rendezvous for the forces at Arras was fixed for the 15th August, every man to come provided with all things suitable for his rank.

On the 25th July the besiegers hurled into the town incendiary bombs in a attempt to set alight to the buildings, but they do not seem to have occasioned any serious damage.[2] The besiegers now realised that so far they had made little material progress beyond bringing the place nearly two months nearer to starvation and so they had recourse to another means. They constructed three battering rams, each fitted with four wheels. Two were then driven against the Messines Gate, whilst the third one was used against the

[1] Vauban recognised the possibilities of this marsh, to assist in covering the south-western face of the place, when he fortified Ypres at the end of the XVIIth century. The great engineer turned the marsh into an artificial inundation, that was then called the Bailleul Inundation.

[2] They were not fired from the guns, because at this time the projectile used from a gun was stone shot. The bombs were flung by a weapon of the sling type, such as a trebuchet, or a mangonel.

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Dixmude Gate.[1] With the assistance of these rams the seventh general assault was delivered. But the Yprois met this serious menace in the right way: their fighting spirit had not weakened and they issued in force from their gates, after a grim fight made themselves masters of the machines, destroyed them at once, and killed or took prisoner the detachments who had been working them. Thus this most serious attack was completely frustrated.

But provisions were running low in the besieged town and privation was gradually being felt. To improve the situation a vigorous sortie was made and the Yprois succeeded in driving the enemy back from one of his encampments and seizing there a great store of food, which was at once taken into the town. Warned by this the besiegers moved back their store and supply depots and re-opened them behind the suburban defence line, well out of striking distance of their foes. Further, to give early warning of any further sorties, posts were placed and maintained on the belfry towers of the two suburban churches that were beyond the northern face, and other posts were established on the convents and other lofty buildings in the suburban area.

Shortly after this sortie the Bishop of Norwich sent in a flag of truce to demand the surrender of the place, and a safe-conduct was promised to any deputation that might be sent out to discuss terms. Actually a deputation did proceed to the Bishop's head-quarters, but popular feeling was too strong, and the defenders, proud of the undoubted successes they had achieved and relying on French assistance, determined to continue the defence of their town to the bitter end. The deputation therefore returned to Ypres. Hardly had they re-entered the place, when a new assault was delivered and this time against several points simultaneously. But the defenders stood their ground, beat back all the assaults, and drove off the enemy with heavy loss.

On the 50th day of the siege (27th July) the Bishop once more demanded the presence of four of the principal inhabitants to

[1] It is not clear whether these rams were brought into action inside a 'Cat' or not. A Cat (called a Rat in some parts) was a low, long timber gallery covered with a very pointed and strongly ironed roof. Placed on wheels these galleries were advanced to the foot of the walls, after the ditch was filled up, or against a gateway, and work could then be carried on under cover.

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whom he gave a princely reception. He made a supreme effort to compel them to agree to the surrender of the place, but the representatives from Ypres stood firm, and adhered to their resolution to hold out whatever the cost, even though they were buried under the ruins of their city. The besiegers then redoubled their efforts and delivered a fresh assault. But this proved to be no more successful than the earlier ones. On the 53rd day of the siege (30th July) the besieged made a feint at a sortie from the Steendam postern, to draw the besiegers attention in this false direction. They then delivered three sorties simultaneously from three other gates and raided the quarters of the English.

Impressed by this active resistance the besiegers, realising the little success so far obtained in the reduction of the place and the casualties incurred by them, now concluded an armistice with the besieged which truce lasted for some days. The English, in particular, welcomed a suspension of hostilities, because of the hurried withdrawal of part of the Gantois contingent. This party had to return at speed to Ghent, to assist their fellow townsmen in resisting the numerous raids on their district which were carried out by those who remained loyal to Count Louis.

The armistice only endured until the 57th day of the siege (Monday 3rd August) when the Gantois contingent returned. At noon on this day, the besiegers delivered simultaneous assaults against five different points, using bridges which had been previously thrown across the moat and had remained in position during the armistice. Apparently on this occasion the besiegers actually gained a footing on the berm of the rampart itself, and they were only brought to a standstill by the impenetrable thorn hedge that grew on the superior slope of the parapet. Behind this hedge the besieged stood grimly at bay, discharged their missiles and arrows against the assailants, and eventually beat them off with heavy loss.

During the nights of the 4th and of the 5th August the besiegers busied themselves with improving their bridges by means of planks and fascines, and at several points they managed to bridge both ditches and once more reached the berm below the thorn hedge entanglement.

On the 60th day of the siege (Thursday, 6th August), realising that the foot of the rampart was almost surrounded, the Yprois

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unfurled the banner of Flanders—Gold, a lion sable[1]—above the Boesinghe Gate and in front of the Gantois contingent. On the same morning the Gantois pushed up a wheeled battering-ram and brought it into action against the Steendam postern. This new menace was swiftly countered. The besieged made a sortie from the postern itself, seized the ram and either killed or made prisoners the detachment that worked it, and effected a safe withdrawal into the city.

Meanwhile the men watching by the banner of Flanders, that now floated over the Boesinghe Gate, saw that the Gantois, who occupied a small fort situated close to the old suburban defence line and between the Yperlée and the Boesinghe road, had also run up the Flemish flag, but in mockery they had displayed it reversed. This stung the besieged into action, and it is said that they made a sortie from the Boesinghe Gate, dashed at and stormed the small work, killed the garrison, and brought back the flag as well as an enemy machine which was in the fort, and other plunder.

On the 61st day of the siege (Friday, 7th August) the English assaulted the Messines Gate, and made an attempt to burn it down. A cart filled with inflammable materials was pushed up against the gate, but before the flames had got any hold a sortie was made by the company holding this sector of the defensive line, and the assailants were overpowered and forced to retire.

On this same day news arrived at the English headquarters outside Ypres that French assistance for the town was on the way, a part of the relieving force had already reached Arras, and the whole army would have assembled there by the 15th August. According to Froissart the French troops alone mustered 80,000 men, of whom 20,000 were mounted Knights and men-at-arms.

Time was now pressing, and a last effort had to be made to overcome the stubborn resistance of the Yprois before Charles the VIth intervened in strength and raised the siege. Thus on the morrow, the 62nd day of the siege (Saturday, 8th August), the besieging army prepared a last general assault to be delivered at daybreak. The considerable activity in the enemy's camps had not

[1] The Flanders coat was borne by Charles the Bold, Duke of Burgundy, (K.G. 1469-1477) as an escutcheon of pretence on his shield of arms. His Garter Stall Plate is still in St. George's Chapel, Windsor, and is affixed to the panelling at the back of the fifth stall on the Sovereign's side.

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escaped the notice of the besieged, and the Viscount of Ypres, the Castellan, caused the forces to muster in the Grande Place and nine of the captains were then dubbed Knights.[1] This ceremony being concluded the sixteen companies returned to their respective portions of the defensive line to await the delivery of the attack.

The first assault was launched against the Messines Gate and was driven off. Another was attempted between the Messines and Temple Gates, the assailants crossing the marsh over fascines.[2] This also failed. Two other attacks were launched against the Temple Gate and the Steendam postern, the assailants brought forward floating bridges mounted on rude wheels, and then pushed them into the ditch, and they were also provided with ladders, but both attacks were beaten off decisively. Ill feeling between the allies now came to a head. The Gantois had boasted that, considering the proven lack of courage of the Yprois, the place would fall within the first three days. The English said the Gantois were perjurers and traitors, and the latter to wash out these reproaches and to prove that they had fully borne their share of the dangers of the siege, now delivered a furious assault against the Dixmude Gate. But the defence held firm, and though the Gantois backed their onslaught with all their missile-throwing machines and battering weapons this assault too was repulsed.

But the English were not willing to own themselves beaten and on the same day they drove home a strong attack against the Thourout Gate. For a moment it looked as if Fortune was about to crown this attack with success. After heavy losses the English won through the moats and stood on the berm of the rampart, and even forced and hacked a way through the impenetrable thorn hedge strengthened by palisades. But they reached no further. The Yprois were undaunted, and at this critical moment redoubled their efforts. The assailants were pelted with missiles, deluged with boiling oil and water, and masses of burning material were hurled among them. Gradually the English gave ground and finally they abandoned the attempt having suffered very heavily.

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[1] The Counts of Flanders only accorded this privilege to the Castellans of Ypres and Dixmude.

[2] This seems to prove that the marsh was by no means dry at this season, or this duckboard track would not have been necessary.

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One more effort was to be made. After several hours of rest another general assault was launched at the seven points where there already existed means of crossing the moats. This attack was the last and it was delivered with all the force and energy of which the assailants were capable. But the defence rivalled it for obstinacy and courage, and finally the last attempt was beaten off.

The Siege is Raised.

The Bishop of Norwich now realised that operations around Ypres must be discontinued, unless he was prepared to risk a disaster. He heard that the French forces were assembling around Arras, and there seemed no chance of Ypres falling to a general assault in the course of the next few days, even if he was prepared to stand the losses that a successful attack must entail against such defences and such a stubborn garrison. He resigned himself therefore to the inevitable, and he decided to raise the siege at once, and arranged with the Gantois that they should withdraw to Ghent whilst the English fell back on Bergues and Bourbourg. The retreat from Ypres began that same night. The trial was at an end, and fortunately so, for the town had just begun to suffer horribly from privation.

Ypres had withstood a siege of nine weeks. The garrison had beaten off no less than twenty-three assaults and had made numerous sorties. The siege was undertaken by a bold and energetic enemy, it was skilfully conducted, and all machines known to siege warfare at that time were employed in it.[1] But the proverb, *Place attaquée, place prise*, was not then true. Nobody in those days could tell when or how a fortified place would fall into the hands of the besiegers, however numerous they might be. With a determined garrison and plenty of water and provisions, a siege might be prolonged almost indefinitely; and without accurate and heavy gun fire it was not possible to quicken up the siege operations or make them a matter of accurate calculation.

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[1] The losses suffered by besiegers and besieged at Ypres are not known, and it is impossible to make any estimate of them.

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THE TUINDAG.[1]

Naturally in those days their fortunate deliverance from their enemies was regarded by the Yprois as miraculous, and was attributed by them to the intercession of the Holy Virgin, then as now the Guardian Saint of Ypres. Her image up to 1914 was enshrined in the Cathedral Church of St. Martin and invoked as *Notre Dame de Tuine*, or Our Lady of the Enclosures, an allusion to the principal material defence of the town, the thick interlaced thorn hedge.

In 1384, to keep alive the memory of the successful issue of this famous siege, there was instituted in Ypres a yearly Festival called *Tuindag*, that is to say, the day of the enclosures, and the anniversary was fixed for the first Sunday in August. This festival flourished for five hundred years, and was still kept at the end of the XIXth Century, but possibly the deeds of British troops in front of Ypres from 1914—1918 will now alter its character somewhat, and no longer will it be a thank-offering to the Virgin for delivering the town from the English.

END OF THE BISHOP OF NORWICH'S EXPEDITION.

After the besiegers retired from before Ypres the Bishop of Norwich's force broke up into several contingents. Part retired at once to Calais and crossed to England, the Bishop and a body with him moved to Gravelines, and the remainder, about 4,000 strong under Sir Hugh Calveley and Sir Thomas Trivet, occupied Bergues and Bourbourg.

Charles the VIth who had reached Arras, heard there that the siege of Ypres had been raised and consequently opened his advance on Aire and St. Omer, whilst the Constable, Clisson, with the advanced guard attacked and captured Cassel. The French then marched on Bergues which was evacuated by the garrison who retired on Bourbourg and Gravelines. Bergues was handed over

[1] There is an excellent book giving a most detailed account of this festival, it is the fifth volume in a *Ypriana* series and is entitled *Tuindag et Notre Dame de Tuine* by Alphonse Vandenpeereboom. It was published at Bruges in 1881. In this book there is a plate of Ypres during the Bishop of Norwich's siege, showing the operations actively in progress. The plate is a reproduction of an engraving published in 1610, the latter representing a much earlier original picture. The programme for the *Tuindag* procession in 1833 is given in an appendix to this book.

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to pillage. Bourbourg withstood more than one assault, but finally it was surrendered, the garrison being allowed to march away with the honours of war, taking with them their horses, arms, and effects. Charles then moved on Gravelines and summoned the Bishop to surrender the place, offering him 15,000 marks for the supplies in the town, and giving him permission to retire with his troops, wherever he pleased. The Bishop of Norwich asked for a fixed time in which to consider the proposals, and this being granted he sent for assistance to England, but nothing arrived by the date appointed, and he then agreed to the conditions, dismantled Gravelines, and returned from Calais with his troops to England. His campaign in Flanders was at an end.[1] But he and his men had left their mark on the six overlordships of the Coastal plain, they had almost destroyed several towns and the whole country had been pillaged and sacked. Part of the Gantois too in their retreat moved to Nieuport and attempted to surprise the town. At first unsuccessful they finally broke in, put many of the defenders to the sword, and so completely gutted the place by fire that not a single house remained standing intact. With the exception of persecution for so-called religious motives, civil strife is the most bitter of all.

Flanders united with Burgundy.

On the 29th January 1384 Louis of Mâle died. He left an only daughter Margaret who had married Philip the Bold, Duke of Burgundy, and Flanders now became a portion of the great Burgundian domain and its history as a separate state ceased from the date of this acquisition. For a time, despite the power of Duke Philip, Ghent remained in rebellion, but at last a peace was patched up with the Duke at Tournai in December 1385. After the siege of Ypres in 1383 Duke Philip refused to permit that the suburbs of the place should be again re-established, because of the civil strife and quarrels that they encouraged. Consequently their inhabitants scattered, taking with them their weaving trade. Only two of the suburban churches to the north of Ypres were retained,

[1] The Bishop was impeached before a Parliament summoned to meet at Westminster on the 26th October and he was sentenced to make fine and ransom at the King's pleasure, and the temporalties of his bishopric were seized for this purpose. The Bishop, however, assisted in repelling a French invasion of Scotland and his temporalties were restored in 1385. Henry le Despenser died in 1406.

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and the others which had been very badly damaged in the siege were pulled down, and their parishes incorporated in two of the city parishes. At the same time it was decided to pull down almost all the buildings in the outskirts that had been burned during the siege, and as the Duke of Burgundy wished to strengthen the defences of Ypres by surrounding it with walls, all the bricks and stones were collected from the demolished houses to be used in the construction of the new masonry *enceinte* that was now decided on.

YPRES BECOMES A WALLED TOWN.

In 1388 the construction of this *enceinte* was begun under the direction of John of Comines, the engineer,[1] and the expense of the work was borne by the town. The first stone was laid on the 6th April at the Thourout Gate, and the work of construction then proceeded as follows:—

In 1388 the walls between the Thourout and Boesinghe gates were built. By 1390 the new work had reached the Steendam postern.

In 1391 the walls were continued to the Elverdinghe gate.

By 1392 the new work reached the Butter gate.

By 1393 the walls between the Butter and Temple gates were finished.

In 1394 work was started again from the Thourout gate but going in the reverse direction, and in that year it reached the Hangoart gate.

In 1395 the work had reached the Messines gate; and in 1396 the encircling of the town was at length completed, by the walls being extended from the Messines Gate to that of the Temple. It had taken over eight long years to complete.

This new *enceinte* consisted of a crenellated wall, provided with six large towers and numerous turrets. At the foot of the wall a berm was left to set back the walls from the ditch and to protect the masonry work from the erosive effect of the moat waters and to cover the foundations of the work. Inside, a high and wide platform raised up the defenders so that they could make use of the crenellations pierced in the walls. The six big towers were

[1] It will be recalled that he had served throughout the great siege.

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provided with casemates suitable for the storage of ammunition, and in two of the turrets there were small powder magazines.[1]

Looking at a plan of this new *enceinte* the most striking fact is that on the long stretch of the eastern face as well as on the whole of the northern face up to the Yperlée there was only one tower, placed at the angle by the Thourout gate, and one turret close to the Boesinghe gate. But on the southern and western fronts between the Messines and Elverdinghe gateways, the *enceinte* was provided with five towers with casemates and a number of turrets. But on this strong front nature herself was kind, for the ground beyond the ditches was marshy and unfavourable for an assailant to use. It is not easy therefore to fathom what induced John of Comines to adopt this plan. It is true that at this time little attention was paid to flanking fire, because the trace of the new walls almost exactly followed that of the old earthen rampart. This probably made the work on the foundations easier, and in particular the old double moat could be and was preserved.

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With the promotion of Ypres to be a walled city the first part of her story may be fitly brought to a close. We take leave of her in all her grandeur, the ornament of Western Flanders, alike in beauty, stateliness, wealth, and strength, full of fame and honour as a result of the brilliant and successful defence of 1383, and now reborn to additional importance. Her past had been glorious, the close of the XIVth Century saw her at her zenith. What had the future in store for her?

[1] One of these two turrets was only pulled down in 1854, having been finally used as a laboratory. The other of the two turrets was near the Butter Gate and it blew up in 1658 just before Turenne opened his successful siege of the fortress. In this siege the lodgment, that led directly to the fall of the place, was effected by Morgan's red-coated Ironsides.

That portion of the old crenellated wall, dating from John of Comines' time, that faced the Bailleul inundation, was in later years incorporated by Vauban in his work. It was only pulled down in 1855.

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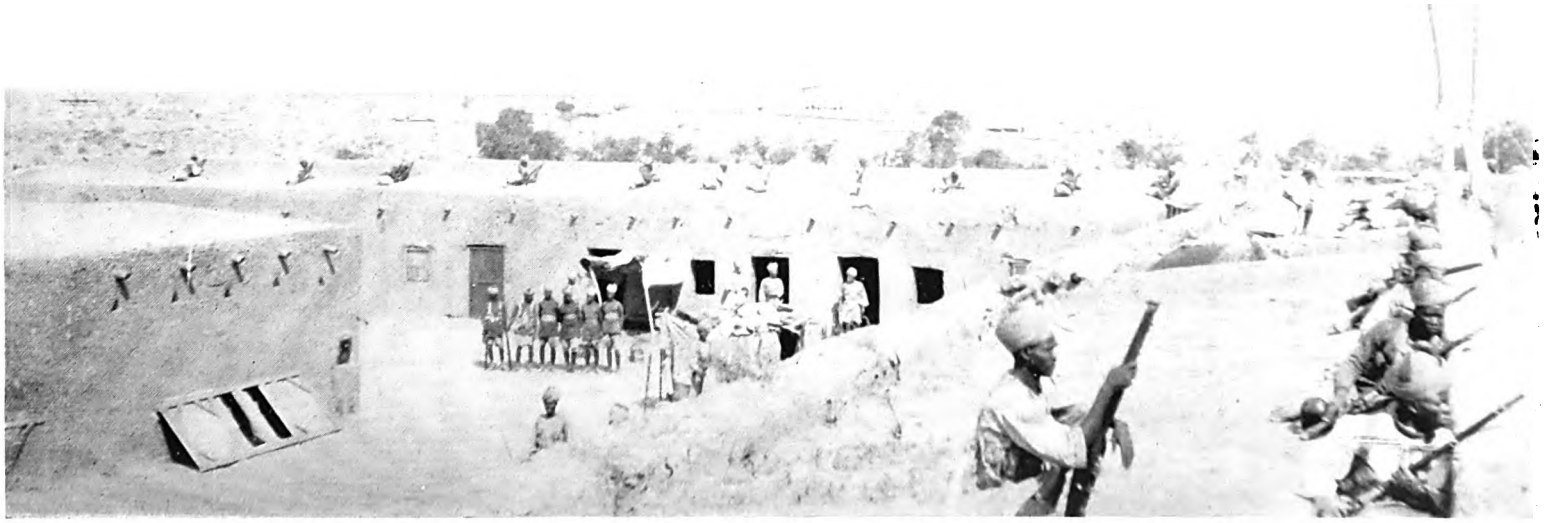

The Fort during an Alarm.

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SHINGA.

By "Kurungarei."

IN the middle of Africa, some seven hundred miles from the nearest rail or river station, there is to be found a small but growing native town. Straight streets, an orderly market place, and clean brick butcher's shop, all point to the hand of British administration, and the town is commanded by a formidable mud brick fort, surrounded by barbed wire and with a business like machine gun emplacement in each corner. Eighteen months ago there was neither fort nor town, the latter consisting of some fifty or more grass huts under the control of a "melek"[1]; but owing to unrest on the part of the inhabitants of the country—the direct result of a serious rising a few hundred miles further south—it was decided in the beginning of 1922 to establish an administrative headquarters and military post in a more central position in the country to deal with any possible contingencies.

The town now boasts of being the capital of a district some twenty-five thousand square miles in area, and inhabited by a mixed population of blacks, speaking five or six different languages; while interspersed with these are to be found scattered Nomadic Arab tribes, the cattle owners and milk purveyors of the country. Here is the residence of the Sultan, head of the old ruling house of the chief tribe in the country, who maintains his position and rules the country with the help of a British resident and a small but efficient native staff.

The fort is pleasantly situated on the top of a cliff overlooking a dry river bed, which for a few short months in the rainy season becomes a raging torrent. It is garrisoned by a company of native infantry under a British officer, with a company of M.I., also under a British officer, as a mobile striking force, the senior of these two being the local commander-in-chief.

At the time when the events about to be related took place, "X" was the only British officer in the station, and the infantry company was commanded by a native officer with captain's rank.

[1] Properly "King" but generally used or headman of a village.

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The resident "A" and his assistant "Y" were both in, and busy with the yearly assessment of taxes, after which "A" proposed to take a somewhat overdue spell of home leave. It was one of those days, typical of Mid-African winter, with a cold dry wind, which seems to evoke the devils of fever from their hibernation, and "X" was sitting in his office in the fort, chilled to the bone, and bored to tears with endless letters and queries from departments sitting in the luxury of civilization and completely out of touch with local matters. Stables were just over and there appeared to be nothing of any further interest for the rest of the day. At best "nafar fulani"[1] might alleviate the monotony of the morning, by applying to divorce his wife, or marry someone else's, emphasising his request by telling some pretty little story in the vernacular about the past life of the lady concerned. But was this shivering merely the result of an extra cold day, or was it the forerunner of another attack of fever which had been laying him out regularly every three weeks since the last rains?

Anyway why could not something happen to relieve this monotonous daily round, and give him a chance of testing his ideas on the training of M.I. Even the farrier sergeant had complained only the day before that the days of good wars seemed to be over—"X's" thoughts were interrupted by the arrival of a messenger with a note from the Resident: probably one of his soldiers had been committing some awful atrocity and was wanted for the administration of civil justice! Why couldn't soldiers behave themselves like self respecting citizens, if such a thing existed in that country? But as he read his expression changed, all thoughts of fever and boredom vanished from his mind—"Dear 'X', can you arrange a short sharp war? Come and see me this morning when you are free."

Surely the gods had answered his prayers!

The Resident's house known to the natives as the "palace," is a magnificent edifice of locally made red brick, with a thatched roof, and is the only building in the place which does not leak in the rains, a fact of which the Resident is justly proud. As no offices had as yet been built, this house was fulfilling an official as well as

[1] Private So and so.

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a private role, and one room had been converted into a temporary office.

When the C.O. arrived he found the Resident and "Y" sitting in long chairs engaged in earnest conversation with two white robed natives who were sitting in a respectful attitude on the floor in front of them, and who rose on the arrival of another Britisher. A welcome glass of sherry and a biscuit having been satisfactorily dealt with "X" was briefly made au fait with the "casus belli." It appeared that the two white robed gentlemen Mohammed Bugu and Hag Isagha had some time previously been sent out to assess taxes in one of the northern districts, a job for which they were well paid to overcome their natural inclination to accept bribes. These tax-assessing boards usually consisted of three members, one of which was a "fiki,"[1] who gave each village a "waraga"[2] on which was written the amount of taxes due from it. They were given a district to assess and on completion returned to H.Q. and handed duplicates of the "waragas" to the Resident. The Board of which Mohammed Bugu and Hag Isagha were members had completed the greater part of their district and had arrived at a group of villages, bordering on the frontier between British and French territory, which were all under one melek—an old man named Shinga. Now Shinga had been rather truculent on the subject of taxes the year before, and had as a matter of fact avoided payment, owing to the distance he then was from the nearest government post, and encouraged by last year's success he now point blank refused to accept a "waraga." This was a situation the board had not bargained for, and they retired to talk the matter over with a neighbouring Sultan. After due deliberation they decided to go back and have another try to make Shinga take his "Waraga," but on arrival at Mumandur, the first village, they were met by a number of Shinga's men armed with spears which they started to throw as soon as the board got within range. One of the followers of the board was hit in the forehead and this decided Mohammed Bugu who was the "president" to beat a dignified retreat and report the matter to the Resident, which now accounted for "X's" presence in the "palace."

[1] A holy man; but used for anyone who can read and write.

[2] Paper.

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The Resident wanted Shinga arrested and all his able-bodied men brought in to do a couple of month's work as a punishment. If possible there was to be no bloodshed. A careful perusal of the map—a very excellent sketch made by the Resident on one of his journeys in that part of the district—showed Shinga's group of villages to be some 50 miles north, so as surprise was all important, "X" decided to take 100 men of the M.I. company, start in the morning, and surround the villages at dawn the next day. "Y" was to accompany the expedition, with Mohammed Bugu and Hag Isagha as guides. Endeavours to elicit useful information as to the nature of the country from these two gentlemen proved fruitless, as they could be induced to make no definite statements as to whether it was open *goz*[1] or thick bush.

Arrived back in his office in the fort to make all arrangements for an early start next day, "X" again felt what seemed uncommonly like fever symptons, and sent an orderly to the hospital for ten grains of asperin; but it was of no avail and in another half hour he was in the grip of a racking go of fever. There was nothing for it now but bed, so having sent a note to the Resident he made his way to his house with a heavy heart and an aching head, and by three o'clock was groaning under numerous blankets with a temperature of 104. Shinga had to thank a mosquito for a few more days of respite.

By evening the next day the fever had completely gone, and the day after was spent resting and making all arrangements to start at dawn the following morning. Six o'clock on a chilly morning found the M.I. company with three days' forage on pack mules, drawn up in front of "X's" house, and on the latter's arrival the orderly officer cantered up and reported all present and correct with the exception of the medical orderly. Of this individual no one seemed to know anything except that he had been detailed by the doctor the evening before, so after waiting for twenty minutes during which tempers were not improved, the doctor was sent for, roundly damned and told to produce a medical orderly at once or sooner. In due course the original orderly arrived having kept everyone waiting for the best part of an hour, and said he could

[1] Rolling sandy country sparsely covered with bush.

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not go as he had fever; but "X" was not to be put off, as he strongly suspected an acute attack of cold feet, and a thermometer was produced, which showed a perfectly normal temperature. The doctor having further certified that nothing was wrong, our yellow friend was ordered to have ten lashes then and there, which brought forth loud lamentations and calling upon Allah, much to the amusement of the black soldiers, who consider it a disgrace even to flinch when receiving this form of punishment; in fact it is pastime in many tribes for the men to flog one another with a kurbag on occasions of merry-making, and the man who flinches is disgraced for ever in the eyes of his women folk.

A start was at length made at 7 a.m., the company moving off in line of troop columns, each troop in single file—a very convenient formation wherever the country is open enough to allow it. The first twelve miles of the march lay through open *goz* country, sparsely covered with mimosa and gum bushes, and intersected at intervals by dry wadi beds bordered by tall acacias and mahogany trees, with here and there wide spreading dark green gemaizas, affording a pleasant rest to the eye after the glare of the sun scorched *goz*. Frequent villages of grass huts are perched on the top of the *goz* along the sides of the wadis where are situated the wells from which the inhabitants draw their water; while around the villages the surviving stalks of last year's crops wait their final removal for making and repairing the grass stockades which surround most of the houses. At 10 a.m., a halt was made in the dry bed of a large wadi, where there was ample shade from the midday sun and good grazing for the horses. Animals were watered here from the wells—a tedious business as the water has to be drawn up bucket by bucket to fill the canvas troughs or native *tabareiks*[1] from which the horses are watered.

After lunch and an hour's sleep under a shady gemaiza, the officers and guides were summoned to a conference, and the objective, which had been kept secret, was explained to them. The plan was shortly as follows:—

It was proposed to halt for the night about seven miles short of the nearest of Shinga's villages, and moving off again at about 5 a.m. to arrive at dawn before the occupants of the village were

[1] Mud troughs made by the natives for watering cattle.

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astir. On a signal from the O.C., No. 1 and No. 2 troops were to gallop out and form a cordon on the left and right of the village respectively, the points of the horns meeting in rear of the village, and the distance of the cordon from the village to depend on the nature of the country. These two troops were to remain mounted and were on no account to fire into the village. The remaining two troops were to accompany the O.C., one dismounting, fixing bayonets and advancing into the village, and the other remaining extended outside. The transport mules were to be left in the zareeba in the night encampment, where it was hoped the company would rejoin them after having captured Shinga and his braves. If possible there was to be no blood letting, but this of course would depend entirely on the attitude of the enemy.

At 3 p.m., the company again moved off, following the bed of the wadi which necessitated moving in single file and reducing the pace to a walk. The bush in places was very thick and pleasant shade was afforded most of the way by the tall acacias along the track, and "X" had dismounted in the hopes of shooting the evening meal, which a lucky running shot at a gazelle shortly afterwards produced. Debouching on to more open ground the pace was quickened and at 7 p.m., a halt was called near some wells where fires were lit and horses and men fed.

Consternation was caused when it was reported that "Y's" bed and cook were missing, and as it was now dark it was feared that they had fallen out and missed the way, but they turned up soon aftewards and "Y's" peace of mind was restored.

The march was resumed at 10 p.m. through difficult country intersected with stony water courses and thorn scrub, and going would have been well nigh impossible but for the friendly light of a full moon; and at 12.15 having reached water the guides informed "X" that there was only one group of villages ahead before Mumandur—the first of Shinga's villages—was reached. All attempts to elicit the approximate distance to the latter proved futile, and the guides would not commit themselves further than to say that it was neither very near nor yet very far. There is nothing more exasperating to the civilized mind than this absolute lack of either units of time or distance in the repertoire of the African native and one has to accept statements with regard to

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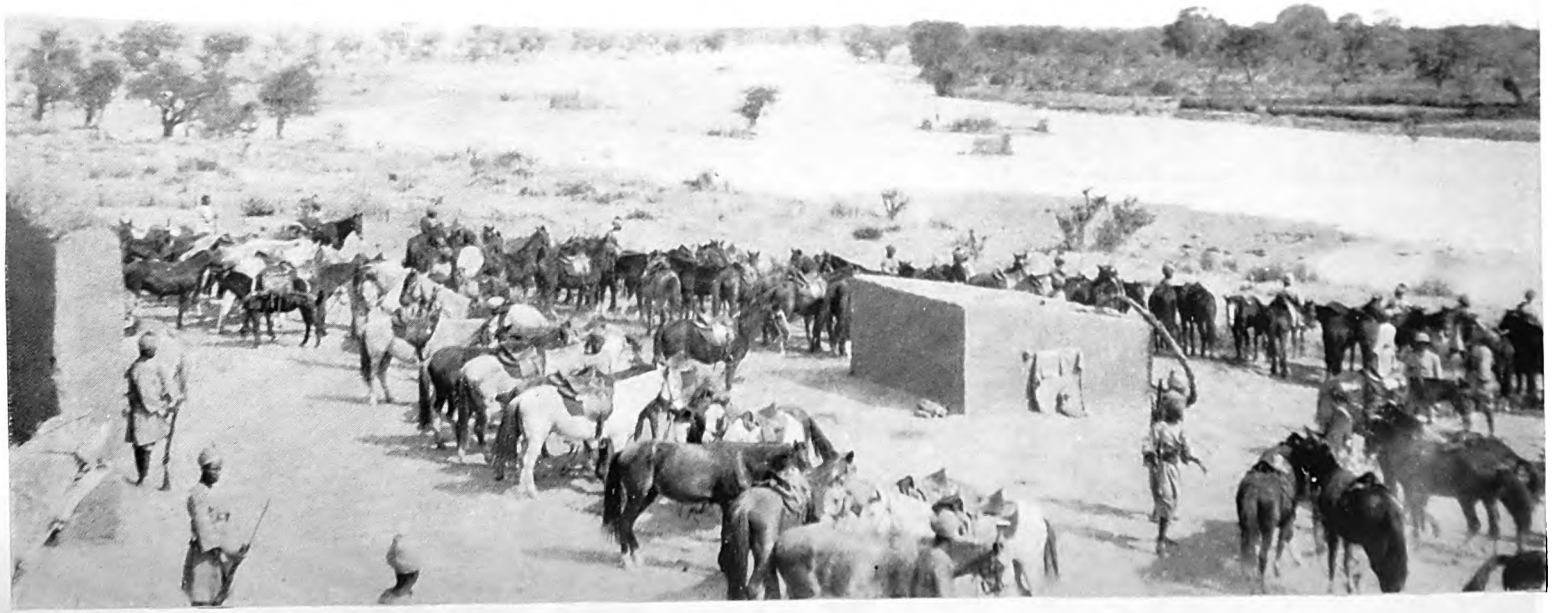

M.I. Horses picketed under the walls of the fort during an Alarm.

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either with the greatest caution. However "X" reckoned that he must be some eight miles from his objective, and decided to make a zareeba and halt till 5 a.m. Thorn bushes were cut, a zareeba made, and sentries posted, and by 1.30 a.m., everyone was wrapped in the arms of sleep, in spite of the fact that no one was out of the effective range of horses heels; but the horses had had a long day and were quite content to keep quiet for a few hours.

Five o'clock saw the company again on the move, their way lit by the waning light of the moon, through country which seemed to grow worse and worse, water courses more frequent, and thorn bushes more persistent in their embrace, and the pace was of necessity slow. "X" was beginning to get anxious as to whether he would reach his objective by dawn, but in reply to his questions the guides informed him always that it was *gareeb* (near) and lengthening out the last syllable to *garee—eeb* by way of emphasising the proximity. Presently just as the first faint changes were showing in the eastern sky, the track, after crossing a wadi, led up on to open country and dogs could be heard barking in a village near by. "Was this Mumandur"? "No—a little further." Useless to argue that he had been told overnight that there were no villages between the company and Mumandur, but if he had estimated his distance correctly the latter must be very close now. The village of the barking dogs was passed just as day broke, and away to the north about three miles distant could be dimly seen a sugar loaf hill which the guides declared to be Mumandur hill with the village lying at its base. No hope of arriving before the sun rose now, and the chances of surprise were reduced by half in this open country; however, forming line of troop columns and keeping as far as possible to the low ground the company pushed on at a brisk trot, till topping a small rise, the villages—there were two—of Mumandur suddenly came in full view lying bathed in the morning sun some thousand yards ahead. Fortunately the country was open and the going good so the order was given to gallop and surround the villages as had been arranged. But the people were all astir by now and some women going down to fetch water from the wells started the alarm, setting up the shrill lu-luing which they do whenever they wish to express feelings of either fear or excitement. A number of the inhabitants now appeared running from

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the village and making for the bush along a neighbouring wadi, so "X" detached one of the two troops which were with him to cut them off and round them up. Dismounting his remaining troop he entered the villages one after the other, and rounded up the inhabitants who were by now thoroughly frightened and put up no resistance, although all the men were carrying spears or throwing knives, all of which were promptly taken from them by the soldiers to the accompaniment of many *abuks* and *ummaks* and other equally coarse epithets in vogue amongs the ribald and licentious of the Sudan. Meanwhile the troop which had been detached to round up the fugitives had been having a little trouble, some of the "enemy" having started to throw spears and knives, and one soldier, his patience tried too highly by a spear passing under his arm and through the slack of his shirt, shot the thrower.

Wishing to get on to the next village where it was hoped Shinga himself would be found, and which was about five miles further on, "X" ordered the assembly to be sounded, and having collected all the prisoners, roped them together by the neck and placed them under a guard, formed up the company and started off for Shinga's village. The going was execrable, thick thorn scrub and stony underfoot, and the scouts thrown out in front lost their direction almost at once so had to be called in as no delays could be afforded.

The five miles was covered in thirty-five minutes in spite of the going, and with clothes torn and faces bleeding from innumerable scratches the company debouched from the scrub on to the open ground round the village. One very old woman and some cows were the only living creatures to be seen. A search of the grass huts produced nothing more except another woman and a baby, with a few spears and knives thrown in.

Keeping two troops in the village "X" sent out the other two to search the surrounding bush and cotton crops—one going north and the other south—and after about ten minutes some men of the troop which had gone south arrived back in triumph with Shinga himself in front of them. They had found him hiding in a cotton patch with his small son, though he emphatically denied that he was aware of the presence of soldiers in his village. In about half an hour the remainder of the two troops returned with about thirty prisoners whom they had rounded up, and after securing Shinga

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and his villagers the company returned to the first village where it was hoped to find sufficient water to water the horses, as the sun was beginning to get hot and they were showing signs of fatigue. It turned out however, that the wells from which this village drew its water were very bad, so it was decided to push on to good wells which were reputed to be quite close, and camp there. One of the guides was accordingly sent to bring the transport animals up to these wells where they would join the company. The usual thing happened with regard to the distance to the wells, and after an hour and a half a question on the subject only evoked the answer that they were quite near.

At about 1 p.m. the transport mules appeared in sight and joined the company and after another half hour the wells were reached. They were situated in the sandy bed of a well timbered wadi which wound its way among pleasant hills whose sun baked copper tinted slopes blended pleasantly with the bright green of the large trees along the banks of the wadi.

The company had covered some sixty-eight miles in under thirty hours and men and horses all being in need of a rest "X" decided to spend a day amidst these pleasant surroundings, and camp was accordingly pitched, horses watered and fed and groomed, and after posting a guard over the prisoners every one turned in for a well earned rest.

Prisoners and booty were counted up in the evening and it was found that the totals amounted to some seventy odd prisoners and upwards of a hundred spears, with a few wicked looking throwing knives. Three or four of the prisoners who proved to "Y's" satisfaction that they were nothing to do with Shinga, but only guests were released and allowed to go back to their villages.

The following day the company started to return slowly to headquarters, halting for half a day in the middle of a bit of country which was said to abound in kudu. "X" being anxious to secure a good specimen of this magnificent antelope spent several very hot hours in the company of two local guides searching for them without success. Fresh tracks abounded in all the sandy wadi beds, and one of the local sportsmen declared that he saw a bull with enormous horns, but he was strongly suspected of letting his imagination run riot. "X" saw nothing but a few gazelle and some ostriches.

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Headquarters were reached on the morning of the third day and after being received with much lu-luing by the ladies of the station and having herded the captives into the fort, "X" joined the Resident and "Y" in the "palace" where the former had prepared an excellent breakfast against the return of the expedition.

This ended the "war," which though of no importance to anyone outside the district had served as a pleasant break in the monotony of ordinary station routine. Shinga was subsequently sentenced to six months imprisonment, and his followers to two months each, as a deterrent to any rebellious thoughts which might enter their heads in the future.

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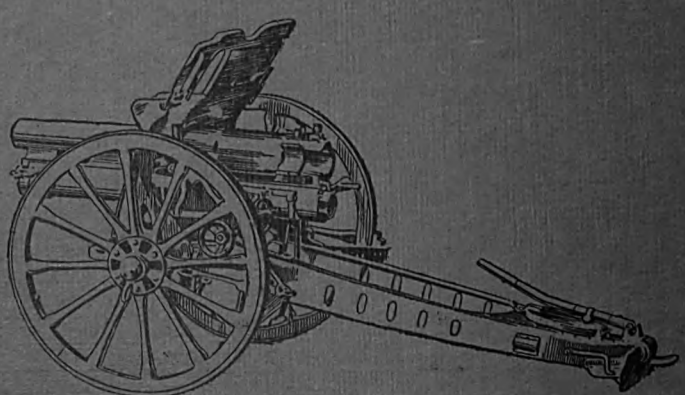

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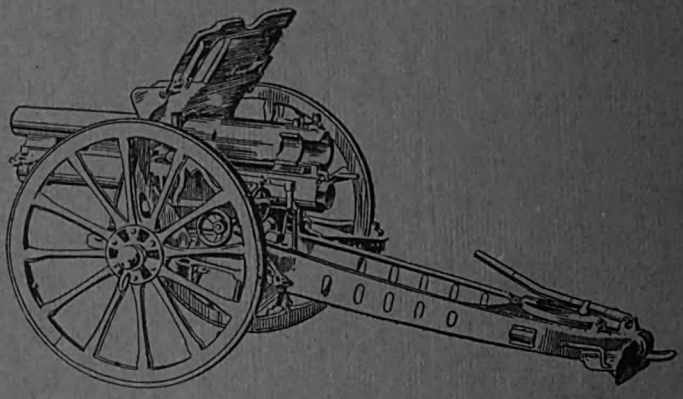

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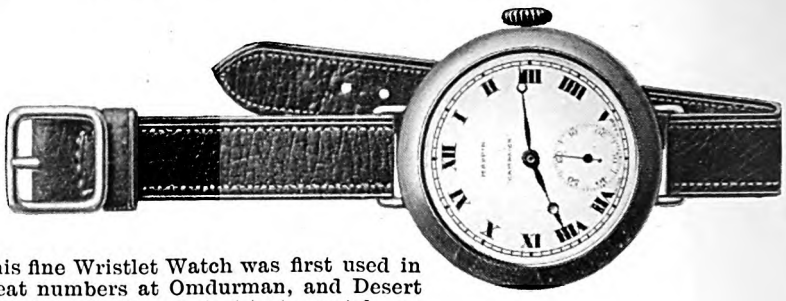

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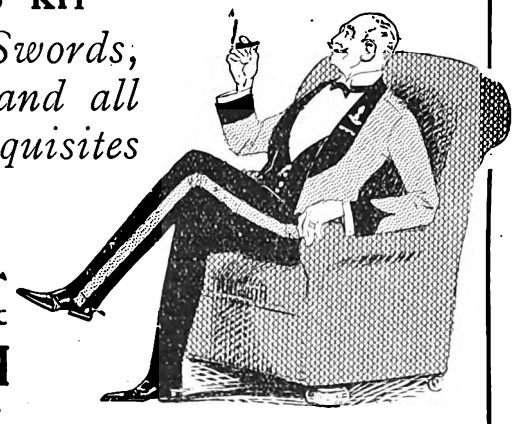

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